Cue System

Design Guide

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Document History

Version	Released	Description
1.00	29.04.2014	Initial version

Introduction

Overview

Cue System at a Glance

CUE has been developing and producing control systems for more than 20 years. Based on this long time experience we have created a family of hardware and software products allowing to realize complete control solution. Wireless and wired touch panels, controllers, interfaces and other products establish a complete ecosystem together with the Cue Visual Composer programming tool. This Windows based programming tool integrates touch panel user interface design and controllers programming.

The Cue System is suitable for small and mid-size installations as well as for large-scale projects with a multiple interconnection of many systems. It is designed to fit any environment, from a living room or classroom all the way to building and residential automation. You create your own configuration scheme in the Cue Visual Composer software, and send it to hardware devices.

Our goals to meet customers demands are

- Providing the best technology, software and services to deliver intuitive user interfaces that ease people's lifestyle
- Creating a scalable, easy to maintain and operate control system
- Excellent supporting
- Good reputation for reliability and friendly assistance
- Well-built personal relations
- Creative team of motivated professionals
- In-depth knowledge
- Multinational customer base.

Cue System Benefits

Flexibility

By definition, a building is subject to change over time. The ideal solution is to have a system that allows the adaptation of buildings according to their new assignments. These changes will be possible without demolishing the walls or installing new circuits.

Comfort

Now everyone is looking for more comfort in their work. An easy-to-use control system simplifies the daily life and work of the end user. The Cue System is the solution for technical management of buildings.

Profitability

The installation costs and ongoing operating expenses are critical to ensure the profitability of an investment of this kind. So the more flexible and easily adaptable the building will be, the more it will cost. And when, in addition, environmental awareness and rising energy costs are involved, it becomes clear that the construction of a building must necessarily integrate intelligent solutions for energy consumption.

Security

To provide users of a building with maximum security, the system must react quickly and be intelligently installed for critical situations, no matter if the owner is present or absent. The possibilities of conventional wiring is limited, and the interaction between different applications is difficult.

Cue System Competitive Advantages

The main Cue System competitive advantages are

- Modern design of control panels
- Simple system architecture
- Fast and effective installation
- Easy and productive programming

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About this Document

Overview

This Design Guide has been created to educate you on the Cue System design using the wide range of hardware and software products produced by the CUE company. It helps system designers, integrators and consultants to develop functional, effective and intuitive control systems. We aim to use this document to increase awareness of the Cue System and its applications.

The Design Guide is not a detailed system description and it does not substitute for other documentation like Cut Sheets, Data Sheets, Application Notes, User Manual, etc.

Document Structure

The document is divided into chapters describing the practical applications of the Cue System. Every chapter is then divided to sections which include description, connection diagrams, etc. Links to available detail documentation, drivers, etc. are listed in the parts named Resources.

Schematic Diagrams

All schematic diagrams are informative and serve for basic understanding of how to connect appropriate applications. They can serve as basic information for electric designers to create detail projects. In any case schematic diagrams are not detail and complete diagrams ready for installers. For example, the diagrams for power units connection don’t solve electrical protection.

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Training

Introduction

CUE training is designed to teach the skills that are required for the programming of the Cue System. Training courses are taught by CUE own consultant, software developer and analyst who practices the Cue System programming on a daily basis. The courses are delivered to small groups of max 3-4 people on an in-house basis with scheduled dates. The instruction language is English. Currently CUE offers four training classes for Cue Visual Composer (CVC) as described below.

Training Classes

1. CVC Basic Training

Duration: 3 days, typically Monday to Wednesday.

If you are new to the Cue System programming, the CVC Basic Programming class is designed just for you. CVC Basic Training is a must for those who are a complete novice to Cue System programming. During the three day course you will be provided with thorough information on CUE products and learn how to program the Cue System. If you have taken the CVC Basic Training course and have programmed a good number of Cue Systems, you are entitled to take the CVC Advanced Training.

2. CVC Upgrade Training

Duration: 2 days, typically Monday to Tuesday.

If you are a user of Cue Director XPL programming software, this training class is designed just for you. Good knowledge of Cue System hardware is required for this class.

3. CVC Advanced Training

Duration: 2 days, typically Monday to Tuesday.

This training is a user-project oriented class with flexible agenda and it is designed for advanced users. CVC Basic or Upgrade Training is required.

In the Advanced Programming class, CUE's top-notch staff will teach you everything you need to know in order to become a CUE expert incl. complex device drivers. During the course we especially focus on individual needs and problems that need to be broadly discussed. Please inform us about the aspects of programming you would like pay special attention to before the actual training. For your requirements please use the space on the application form.

4. CVC Graphic Collection Programming

Duration: 2 days, typically Monday to Tuesday

This training is designed for advanced users of Cue Visual Composer who want to create their own graphic objects for touch panels (windows, buttons, bargraphs, sliders etc.). CVC Basic or Upgrade Training is required. During the class, the programming of graphic objects, creation of graphic collections and libraries will be trained in detail. All available graphic functions will be explained and practically tested during the creation of object examples.

Training Organization

Fees

In-house training classes are free for authorized CUE distributors. Due to the high demand for enrolment in our CUE training courses, please be so kind as to cancel your attendance at least two weeks in advance. Cancellation fee of 100 EUR is charged to all attendees who cancel their attendance later than 4 working days before the training starts.

Travel, Accommodations and Meals

Cost of travel, hotel accommodation and meals are the responsibility of the attendees. CUE can assist you with the hotel arrangement, transportation to/from the airport and visa – if required. CUE sponsors lunch each day, as well as hot and cold drinks during training for all attendees.

Schedule and Registration

Scheduled traning classes and registration form are available here: http://www.cuesystem.com/training_schedule_and_registration.aspx.

For further information please call +420 241 091 240.

Participant's Requirements

- Solid knowledge of Windows user interface
- Elementary graphical format editing skills
- Understanding of number systems (binary, decimal, hexadecimal) and the ASCII character encoding
- Knowledge of some programming language is welcome – Visual Basic, Delphi, Pascal, C/C++, Java etc.

The participant should be equipped with a laptop computer

Hardware

- Intel® Core™ Duo mobile processor 1.6 GHz or better
- AMD Athlon™ X2 Dual-Core processor 1.9 GHz or better
- Memory (RAM) at least 1 GB (2 GB for Microsoft Windows Vista / Windows 7)
- Display resolution 1280 x 800 pixels or better, 32-bit color depth required
- 2GB free storage space on hard drive

Software

- Microsoft® Windows Vista (32 or 64-bit version)
- Microsoft® Windows 7 (32 or 64-bit version)
- Microsoft® Windows 8, 8.1 (32 or 64-bit version)

Technical Support

E-mail Support

Please address your inquiry to one of the following addresses as appropriate

- Hardware and Software: support@cuesystem.com
- Sales and Projects: sales@cuesystem.com

All technical support inquiries submitted via e-mail will be answered in approximately one business day.

Phone Support

Technical Support is available on phone at +420 241 091 247.

Please note that this number is for technical phone support only and is staffed from 7:45AM to 6:00PM Central European Time (GMT+1:00), Monday through Friday (except holidays).

For hardware and software support please attach the information outlined below. This information is necessary for us to successfully help you.

- Serial number of the CUE product
- Firmware version (if applicable)
- Software version and/or date
- Provide a description of your problem.
- Please include as much information related to the problem as possible.

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Terminology

Applet

A part of program that performs specific tasks and runs within the context of a larger program, for example the Sunrise/Sunset Timer or the Simple Scheduler.

Controller

The controller is a CUE device equipped with control ports running XPL^2 runtime. The controller is programmed using CVC and it stores user applications.

CUEdevice

The CUEdevice is a common name for all kinds of devices delivered by CUE which are not connected over a network system communication. This group of devices contains all units connected to CUEwire, PEbus and to RS-232. Each CUEdevice is represented by a CUEdevice driver in Cue Visual Composer.

CUEnet^2

The CUEnet^2 is an application IP protocol used for communication between CUEunits.

CUEunit

The CUEunit is a common name for programmable units equipped with network system communication. This group of devices contains touch panels, touch panel controllers and controllers.

CUEwire

The CUEwire is a serial channel RS-485 (for data communication) and power supply of 24 VDC.

Device

The Device is third-party controlled equipment represented by device driver in Cue Visul Composer.

Device Driver

Part of XPL^2 code which communicates with the controlled device.

Graphic Collection

Set of ready-to-use graphic objects which allows to prepare the touch panel graphical interface.

Interface

The interface is typically a unit with control ports which cannot be programmed. The interface has a fixed set of commands and can be connected using the IP network or serial channel.

PEbus

The PEbus is a serial channel RS-485 for data communication between the controller and interfaces, power switching units, dimmers, etc.

Touch Panel

The touch panel is a CUE product equipped with a graphic display and running XPL^2 runtime. The touch panel is programmed using Cue Visual Composer and stores user applications.

Touch Panel Controller

The touch panel controller is a CUE device with graphic display and control ports running XPL^2 runtime. The touch panel controller is programmed using CVC and stores user application.

Widget

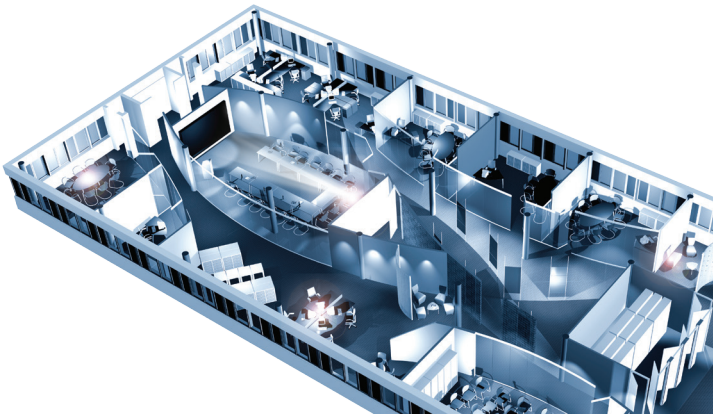
A small full functional application that can be inserted into a Cue Visual Composer project.

Cue System Applications

Commercial

Overview

The Cue System facilitates simple and effective automated controlling of all modern technologies used in contemporary company buildings.



By integrating the control of all technologies into one well-arranged user interface, the Cue System enables all employees to use the equipment safely and without fear of making a mistake. Besides, using the CUE control system reduces the number of employees needed for maintenance and operation, thus lowering expenses.

Further cost reduction results from energy saving, as CUE offers effective and cost-saving control of heating, air-conditioning, lighting and other technologies heavy on energy. The system can also announce failure or maintenance requirements automatically via e-mail or SMS. By introducing all these features, CUE keeps up with the latest trends in building control systems, increasing the prestige of companies which use it.

Meeting Rooms & Conference Spaces

The Cue System offers the following benefits for meeting & conference rooms

- Trouble-free running of presentations, automated one-touch control (for example, by pressing a button labelled PRESENTATION the whole room is set up into presentation mode – the projector is turned on, the projection screen rolls out, AV inputs are switched over to the presentation computer, appropriate light conditions are established, etc.).
- Nobody is put under stress of using complex technologies – the systems offers intuitive controlling with a minimum of control features.
- With the Cue System, the operator can control the entire technical equipment in the room (audio-visual technology, projectors, monitors, DVD players, lighting, heating, air-conditioning, window blinds, etc.) on one panel.
- Lighting can be controlled by pre-set light scenes which set all lighting devices to the desired light mood, simply by pressing a single button.
- Remote control of rooms – if the operator has any problems with running the device, he or she can call the technical centre, which can set things remotely.
- Remote and automated diagnosing, allowing for timely action in servicing (for example, the Cue System sends an e-mail to the service centre indicating that a lamp in the projector needs to be replaced or a filter has to be cleaned, or sends a warning that a device is not working properly).

Training Rooms and Classrooms

In classrooms or training rooms the CUE control system makes it possible to

- Simplify the operation of audio-visual equipment, lighting or HVAC.
- Carry out central supervision of all rooms in the building and administer technology in all rooms centrally (e.g. central switching off of electrical equipment at night including rooms where teachers may have forgotten to turn off some of the facilities).

Museums

The CUE control system facilitates automated control of AV shows in museum expositions both by museum staff and visitors.

Lecture Halls

In large lecture halls, the CUE control system makes it possible to

- Simplify the operation of all complex AV technologies currently in use, such as switching microphones, controlling sound systems, operating matrix switchers, video cameras and signal sources as well as running light effects – all this from one ergonomically designed touch panel.
- Distribute AV technology into several zones at venues where the lecture hall can be divided into more rooms by means of movable walls.
- Manage the distribution of audio-visual signals between several lecture halls.

Government and Justice

The Cue System provides one-touch equipment to control AV technology such as audio and video conference facilities, voting equipment or recording devices in conference and court rooms. It dramatically reduces the number of technical staff needed for the controlling of those devices.

Hotels

In hotel spaces, the CUE control system offers automated control of audio-visual equipment, lighting, heating, air-conditioning and other kinds of modern technology in meeting and conference rooms.

Network Operation Centres (NOC)

The Cue System offers

- Automated operation of multi-screen systems.
- Automated control of distributing AV signals for visual display units.
- Controlling sources of AV signals, video cameras, recording equipment or sensors.
- Elimination of error during operation, simplified manipulation.

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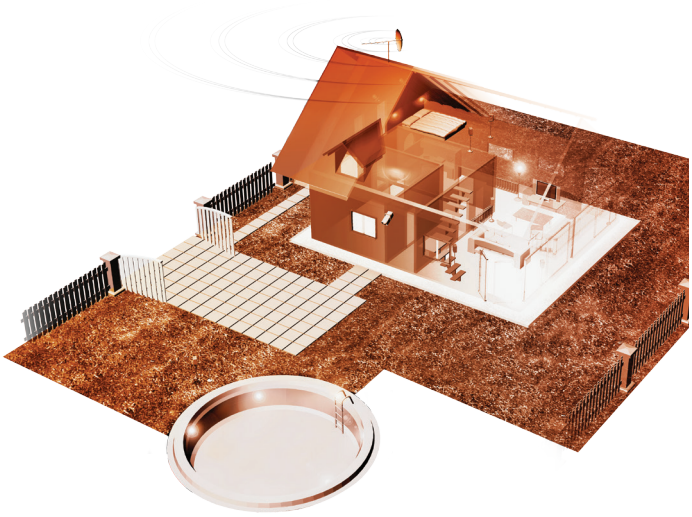
Residential

Personalized Sequence of Actions

The control system can automatically carry out pre-set actions as required by the user. For example, after you come home and disarm the security system, the control system can turn on the lights and heating and switch on background music. TV news comes on at precisely the right time. The system can also record your regular activities during the day and use this data to simulate your presence in the house during your absence, thus discouraging uninvited visitors.



Remote Access to All Home Systems

You can access your home remotely via Internet, e-mail or SMS text messages. Your home web site will enable you to monitor the current state of your house including interior and exterior temperatures, turning on the heating, recording your favourite TV programme or watering the lawn.

Lighting Automation

The control system enables you to control lighting by selecting appropriate illumination levels suited for a given type of activity. If you are watching TV, for example, the system sets up all lights in the room to prevent them from disturbing the picture while maintaining adequate light levels for the room. The lighting can be changed automatically, depending on the time of the day.

Window Drapes, Blackouts and Window Treatments

The control system can automatically manipulate window blinds according to the intensity of sunlight. This helps to regulate illumination and temperature in the room. In summer it can reduce the cost of air-conditioning in rooms subject to direct sunlight. In case of strong wind the system ensures that window blinds and awnings are retracted, protecting them from damage.

Automated Entryways and Gates Control

The connection of gates, doors and windows to the control system facilitates the automated unlocking of doors when you come home as well as automated locking when you leave. Should you forget to close any windows, the system will remind you.

Security and Monitoring Camera Surveillance

Thanks to the switch panels of the control system you can also control the intruder security systems. This means you do not need a separate keyboard for the security subsystem – all you need are the switch panels of the control system. The system can thus turn on the Presence Simulation when you leave and arm, or send you a message in case of any alarm. In addition, thanks to the touch panel of the control system, you can monitor anything picked up by the security cameras mounted in your house. In this way, for instance, you can keep an eye on your children playing around the swimming pool.

Multizone Audio & Video Control

With the help of the touch panel or keyboards you can play your favourite music or turn on your chosen TV or radio programme, setting the volume to the desired level. The control system can automate these procedures for you. For example, it can turn on the news in the bathroom after you get up, switch on relaxing music when you come home, etc.

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Home Theatre Control

The control system enables you to automate and simplify the operation of home audio-visual technology, eliminating the use of multiple remote controls. Pressing a single button WATCH MOVIE on your touch panel, for example, automatically switches on the TV, DVD player and the audio system. The appropriate inputs are selected, lighting in the room is set to the desired light mood and if it is sunny outside, the curtains are drawn.

Heating, Ventilation and Air-condition Control (HVAC)

The control of heating and air-conditioning maintains thermal comfort while at the same time reducing energy consumption and therefore, costs. It is possible to programme suitable temperature modes for various days of the week or various times of the day, and also to establish an economy mode during your vacation. Heating and air-conditioning can be controlled for each room independently.

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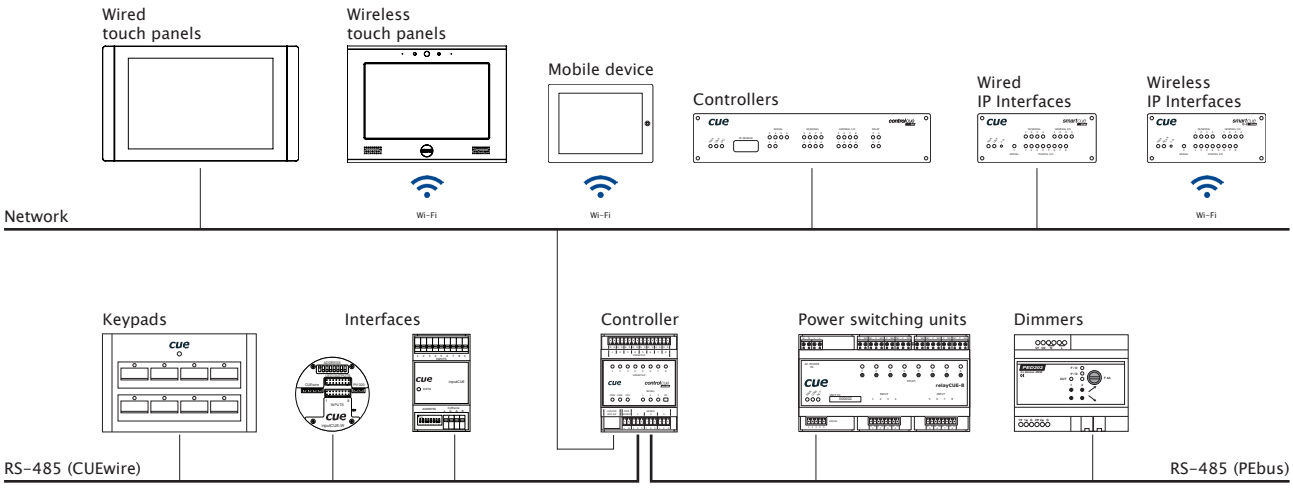
System Communication

Overview

The Cue System currently uses following communication channels

- Network – wired (Ehernet) or wireless (Wi-Fi)
- Serial RS-485 – CUEwire
- Serial RS-485 – PEbus

as described in the following picture.



Notes

- Units with the RS-485 serial communication (both CUEwire or PEbus) can be connected to each controller's serial port which can be set to RS-485 mode.
- Units with CUEwire and PEbus cannot be combined on the same serial port, because there are different communication baud rates and protocols.
- For Cue Visual Composer programming purposes, all units with serial communication are represented by CUEdevice drivers.

Units by Communication

The following table describes the system connection of all CUE units.

Unit	Wired Network (Ethernet)	Wireless Network (Wi-Fi)	RS-485 (CUEwire)	RS-485 (PEbus)	Other
Mobile Solution					
iCUE-standard, -professional		●			
aCUE-standard, -professional	●	●			
pcCUE-standard, -professional	●	●			
Touch Panels					
airCUE-7		●			
touchCUE-5, -5-B	●				
touchCUE-7, -7-B, -7-W	●				
touchCUE-12, -12-B, -12-W	●				
Touch Panel Controllers					
uniCUE-7-B, -12-B	●				
Wired Button Panels					
keypadCUE-8-L-T, -L, -E-T, -E			●		
keypadCUE-1G, -2G, -3G			●		
Controllers					
controlCUE-one, -two	●				
controlCUE-versatile-d	●				
controlCUE-dali-d	●				
controlCUE-knx-d	●				
controlCUE-dmx-d	●				
controlCUE-poseidon-d	●				
ipCUE-alpha, -beta, -epsilon, -delta	●				
ipCUE-gamma, -sigma	●				
IP Interfaces					
smartCUE-zero, -one, -two, -three	●				
smartCUE-zero-wifi, -one-wifi, -two-wifi, -three-wifi		●			
Interfaces					
sensorCUE			●		
sensorCUE-W			●		
inputCUE			●		
inputCUE-W			●		
PEA208				●	
KNXgw232					RS-232
sbiCUE-DMX					RS-232
PEC25					RS-232
PEF150				●	
PEF200				●	
Power Switching Units					
relayCUE-8				●	
powerAUX					Digital inputs
PER610				●	
Dimmers					
PED108				●	
PED202				●	
PET102				●	
PET105				●	

Network

Wired Network

Description

The Cue System uses the standard wired 10/100 BaseT Ethernet as a physical layer for system communication between CUEunits.

Autosense

Autosense refers to a feature found in network adapters that allows them to automatically recognize the current local network's speed and adjust its own setting accordingly. It is often used with Ethernet, fast Ethernet, switches and network interface cards.

When an Ethernet 10/100 card is first connected to a network, the speed is automatically adjusted. The card will default to the highest speed (100) unless the network connection does not support it. The network switch can also autoadjust its speed by autosensing the speed that is required. Various networks switches use autosense on a port-to-port basis.

The term Autosense may also refer to the technique of automatic MDI/MDI-X (Auto-MDIX) which detects whether a crossed-over cable is needed in the Ethernet over twisted pair technology. The Auto-MDIX ports on the network interfaces detect if the connection require a crossed-over cable, and automatically choose the MDI (Medium Dependent Interface) or MDIX (Medium Dependent Interface Crossover) configuration to properly match the other end of the link.

The following table overviews all CUEunits from autosense Auto-MDIX point of view.

Unit	Autosense
Touch Panels	
touchCUE-5	Yes
touchCUE-7	Yes
touchCUE-12	Yes
touchCUE-7	Yes
touchCUE-12	Yes
touchCUE-5-B	Yes
touchCUE-7	Yes
touchCUE-12	Yes
touchCUE-7-B	Yes
touchCUE-12-B	Yes
touchCUE-7-W	Yes
touchCUE-12-W	Yes

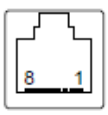
Unit	Autosense
Touch Panel Controllers	
uniCUE-7-B	Yes
uniCUE-12-B	Yes

Unit	Autosense
Controllers	
controlCUE-one	Yes
controlCUE-two	Yes
controlCUE-versatile-d	Yes
controlCUE-dali-d	Yes
controlCUE-knx-d	Yes
controlCUE-dmx-d	Yes
controlCUE-poseidon-d	Yes
ipCUE-alpha	-
ipCUE-beta	-
ipCUE-epsilon	-
ipCUE-delta	-
ipCUE-gamma	-
ipCUE-sigma	-

Unit	Autosense
IP Interfaces	
smartCUE-zero	-
smartCUE-one	-
smartCUE-two	-
smartCUE-three	-

Connection

The 10/100 BaseT LAN is a standard network connection using RJ-45 connector. The length of the Ethernet cable connecting controller to the network must not exceed 100 meters. Cable Cat5e or better is recommended.

RJ-45	Pin	Signal	Cat5 Cable Color
	1	TX_D1+ and PoE	White / Orange
	2	TX_D1- and PoE	Orange
	3	RX_D2+ and PoE	White / Green
	4		Blue
	5		White / Blue
	6	RX-D2- and PoE	Green
	7		White / Brown
	8		Brown

Wireless Network

Introduction

A wireless local area network (WLAN) links two or more devices using some wireless distribution method (typically a spread-spectrum or OFDM radio), and usually providing connection through an access point to the Internet. This gives users the ability to move around within a local coverage area and still be connected to the network. Most modern WLANs are based on IEEE 802.11 standards, marketed under the Wi-Fi brand name.

Types of Wireless Networks

The IEEE 802.11 has two basic modes of operation: the ad-hoc mode and the infrastructure mode.

- In the ad-hoc mode, mobile units transmit directly peer-to-peer.
- In the infrastructure mode, mobile units communicate through an access point that serves as a bridge to other networks (such as Internet or LAN).

Since wireless communication uses a more open medium for communication than wired LANs, the 802.11 designers have also included following encryption mechanisms to secure wireless computer networks.

- Wired Equivalent Privacy (WEP, now insecure)
- Wi-Fi Protected Access (WPA, WPA2),

CUE currently supports the IEEE 802.11b and IEEE 802.11g standards on their hardware.

Wireless Network Type

	Wireless Network Type	
Product	Infrastructure	Ad-hoc
airCUE-7	Yes	-
pcCUE-standard / -professional	Yes	-
iCUE-standard / -professional	Yes	-
aCUE-standard / -professional	Yes	-
smartCUE-zero-wifi smartCUE-one-wifi smartCUE-two-wifi smartCUE-three-wifi	Yes	Yes

Wi-Fi Security Type

	Wi-Fi Security Type	
Product	WEP 64/128	WPA/WPA2-Personal (AES/TKIP)
airCUE-7	Yes	Yes
pcCUE-standard / -professional	Defined by device	Defined by device
iCUE-standard / -professional	Defined by device	Defined by device
aCUE-standard / -professional	Defined by device	Defined by device
smartCUE-zero-wifi smartCUE-one-wifi smartCUE-two-wifi smartCUE-three-wifi	Yes	Yes

Large Area Wi-Fi Network Coverage

To cover a large area by Wi-Fi signal, it is recommended to use multiple Access Points (AP) interconnected through Ethernet with

- Identical SSID
- Different IP addresses from the same address segment
- Preferably different radio channels.

The airCUE-7 wireless touch panel searches for the strongest signal. The maximum of 32 access points can be used.

More Overlapping Wi-Fi Networks

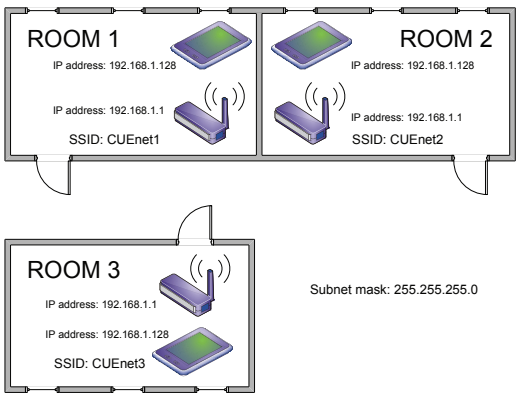
Overview

In some cases it is necessary to install more Wi-Fi wireless systems in one area. In this case the Wi-Fi signal from one Access Point can cover the area where other systems are installed. In such case it is necessary to set the wireless network carefully to avoid trouble during the connecting of the equipment to Access Points.

The primary identification of the Wi-Fi network is the name of the wireless network called SSID. If any equipment is trying to connect of the Wi-Fi network, it recognizes networks only by the SSID. Other settings (IP address, subnet mask) are omitted. If more networks are accessible in one place with the same SSID, the wireless control panel will connect to the network with the strongest signal.

Example

In this example there are three independent rooms close to one another, each room being controlled by the wireless Cue System. Signal from all three Access Points is present in all three rooms.



The right configuration uses different SSID on each Access Point and associated wireless touch panels. It is not possible to use the same SSID for all systems, because it would cause confusion while connecting a wireless touch panel to an Access Point.

If APs are named properly (and APs are not connected to one another via a LAN wire), you can use the same IP address schema for all rooms and in case all rooms are fully identical, you can use the same program for all rooms without modifying the IP addresses.

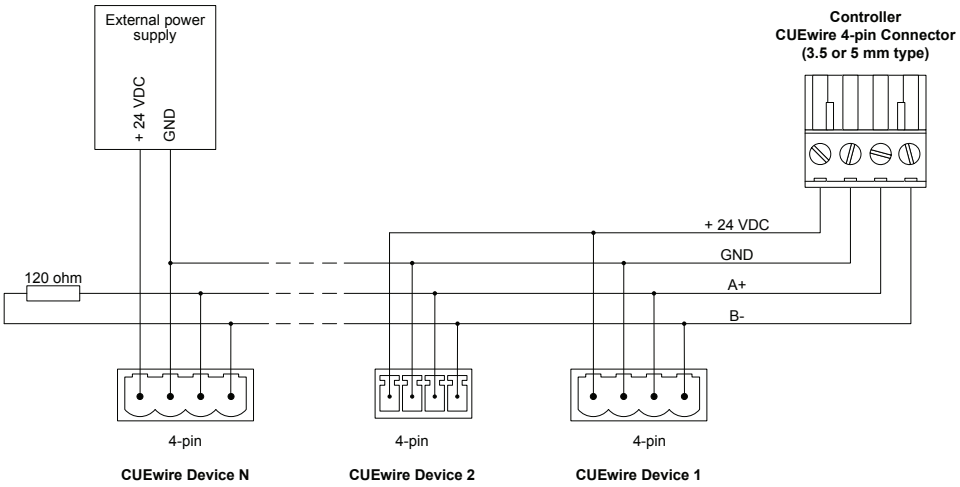
Resources

On how to setup wireless network in more overlapping Wi-Fi networks scenario, see the Application Notes section of our company web site (http://www.cuesystem.com/application_notes.aspx), the document called “Configuration of More Overlapping WiFi Networks.pdf“.

CUEwire

Description

The CUEwire is a RS-485 serial channel (for data communication) and power supply of 24 VDC.



The CUEwire cable consists of 4 wires. The first pair serves as a signal line. The second pair of wires serves for power distribution. The signal conductors can have minimum 0.25 mm^2, maximum capacity 100 pF/m.

The power distribution cable design depends on how many CUEwire devices are connected and on the required length of the cable. The maximum voltage loss on the whole power distribution conductors should not exceed 4 V on the ground wire and 4 V on the +24 V wire. Max. 31 CUEwire units can be connected to one controller serial port compatible with the RS-485 standard.

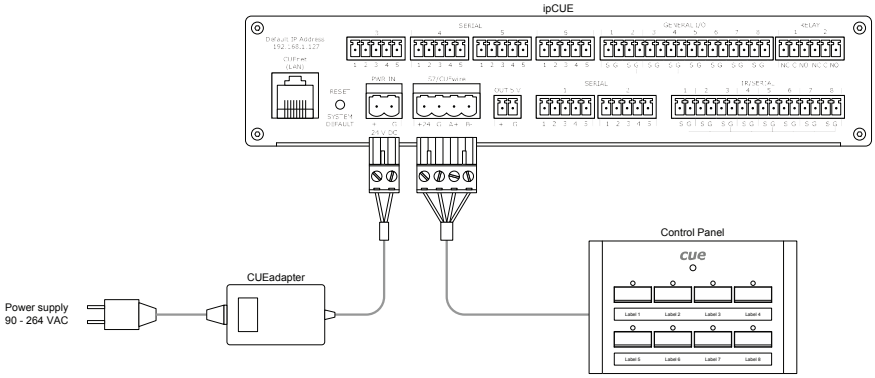
To supply the power distribution line of the CUEwire, the port on the controller can be used. In this case the whole consumption should not exceed 2 A. In case of exceeding 2 A consumption or for longer distances it is necessary to use an external power supply of 24 VDC for remote CUEwire devices (see the example of Control Panel 2 in the picture “Multiple CUEwire device connection” below).

Maximum cable lengths:

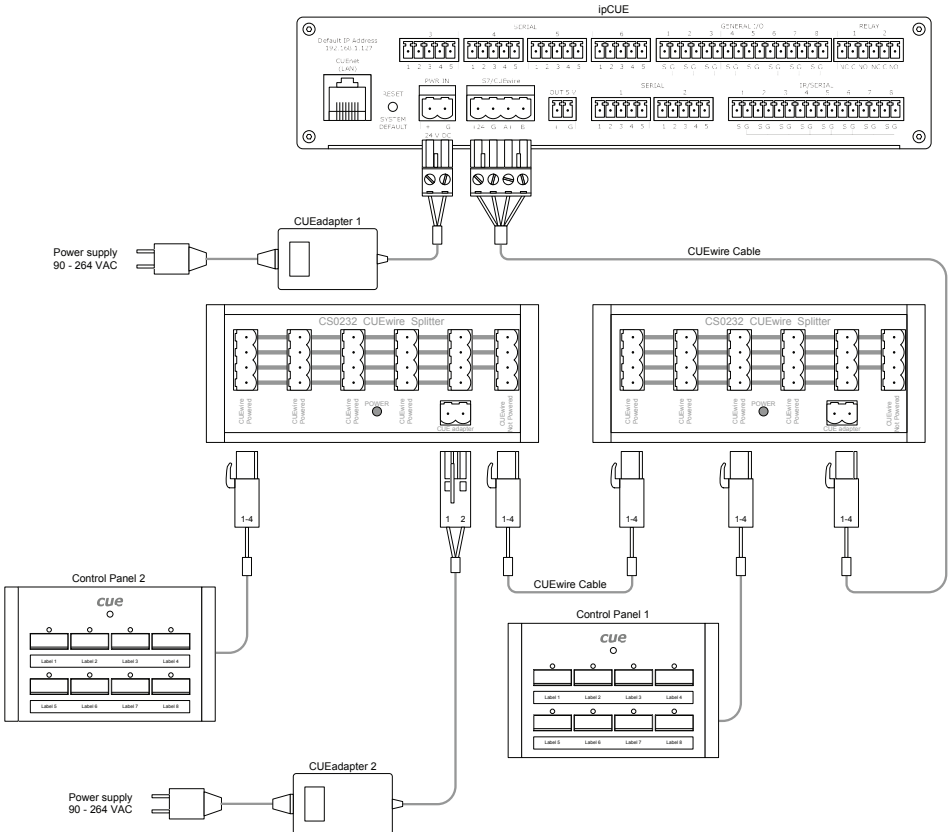
Consumption	Cable 1 mm^2	Cable 2 mm^2
10 W	200 m	400 m
20 W	100 m	200 m
30 W	60 m	130 m

Connection

Simple CUEwire Device Connection



Multiple CUEwire Device Connection



PEbus

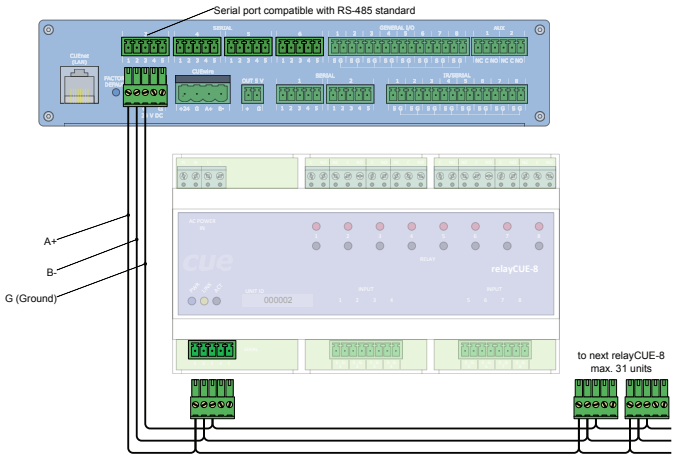
Description

The PEbus is a RS-485 serial channel for data communication between the controller and interfaces, power switching units, dimmers, etc.

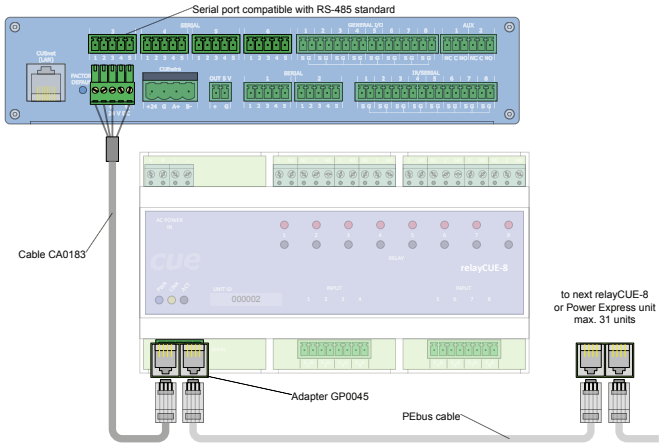
Any controllers's serial port with RS-485 mode can be used as PEbus. Max. 31 units (relayCUE-8 or any PEbus controlled unit) can be connected to one controller serial port compatible with RS-485 standard.

Connection

A typical connection of RS-485 port is shown in the following picture.



The relayCUE-8 can also be connected via supplied CA0183 cable and GP0045 PEbus cable adapter, see picture below. Other PEbus-controlled units can also be connected to this bus.



Addressing

Overview

The PEbus has two different types of address spaces the first for Dimmers and the second for Relays. There are 10 different banks (0 – 9) to increase maximum number of addressable channels.

Each channel (channel means one Relay or one Dimmer channel) on PEbus must have unique ChannelAddress within one Bank. That means a relay can share the same ChannelAddress within one Bank as a dimmer but two relays (or dimmers) can not share the same ChannelAddress within one Bank.

The dimmers can have up to 32 addresses (1 – 32) per one Bank, whereas Relays can have up to 96 addresses (1 – 96) per one Bank.

For example, the relay ChannelAddress 9 and Bank 1 does not conflict with the relay ChannelAddress 9 and Bank 2.

ChannelAddress Calculation

The ChannelAddress for each channel is evaluated by following formula:

ChannelAddress = (Address * TotalNumberOfChannels) + ChannelNumber

Where

- The Address is set in Properties dialog box of given PEbus unit
- The TotalNumberOfChannels is the maximum number of channels on given PEbus unit (for example 6 for PER610, 1 for PED108, 2 for PEA208)
- The ChannelNumber is the number of channel on given unit (1 to 6 for PER610, 1 for PED108, 1 or 2 for PEA208)

For example, the Relay3 on PER610 unit with Address 7 has channel address (7 * 6) + 3 = 45

Note: For PEF150 channel setting you have to set ChannelAddress directly.

How to Check Address Conflict

For this functionality you have to use drivers for PEbus devices with version 6.00 or higher.

Run the project in the debug mode (simulation or hardware) with checked Display Debug Messages in the CUEunit where RS485toPEbus or PEC25 are connected

If there is any conflict it will appear in the Debug Window in the CVC. For example: “WARNING: relayCUE-8 (UnitID 141) has address conflict with another relay unit (UnitID 10933)”.

Power Supply

Units by Power Supply and Consumption

The following table describes the types of power supply and maximum power consumption for all CUE products.

Units	Power supply and consumption				
	PoE	PoE+	12 VDC	24 VDC	230 VAC
Touch Panels					
airCUE-7			15 W		
touchCUE-5, -5-B	Class 0				
touchCUE-7, -7-B, -7-W	Class 0				
touchCUE-12, -12-B, -12-W		Class 4			
Touch Panel Controllers					
uniCUE-7-B				15 W	
uniCUE-12-B				25 W	
Controllers					
controlCUE-one				4 W	
controlCUE-two				4 W	
controlCUE-versatile-d	Class 0			4 W	
controlCUE-dali-d	Class 0			4 W	
controlCUE-knx-d	Class 0			4 W	
controlCUE-dmx-d	Class 0			4 W	
controlCUE-poseidon-d	Class 0			4 W	
ipCUE-alpha				12 W	
ipCUE-beta				10 W	
ipCUE-epsilon				15 W	
ipCUE-delta				18 W	
ipCUE-gamma				10 W	
ipCUE-sigma				24 W	
IP Interfaces					
smartCUE-zero	Class 1				
smartCUE-one	Class 1				
smartCUE-two	Class 1				
smartCUE-three	Class 1				
smartCUE-zero-wifi			3 W		
smartCUE-one-wifi			3 W		
smartCUE-two-wifi			3 W		
smartCUE-three-wifi			3 W		
Interfaces					
sensorCUE				1 W	
sensorCUE-W				1 W	
inputCUE				2 W	
inputCUE-W				1 W	
PEA208					12 VA
KNXgw232				0.2 W	
sbiCUE-DMX				5 W	
PEC25				3 W	
PEF150					12 VA
PEF200					12 VA
Power Switching Units					
relayCUE-8					6 VA
powerAUX					6 VA
PER610					12 VA
Dimmers					
PED108					6 VA
PED202					6 VA
PET102					6 VA
PET105					6 VA

Power over Ethernet

Introduction

Power over Ethernet (PoE) provides a way for network devices to be powered by their data cables. Power over Ethernet is suitable for use with low-power peripherals such as touch panels, control keyboards, sensors, IP telephones, wireless access points, Web cameras, and audio speakers.

The primary advantage of PoE is that you only have to run one cable to each peripheral. This simple elimination of a separate power cable provides a wide range of benefits:

- Save money by eliminating the need to run electrical wiring. By eliminating the need to install separate outlets for data and power, users can save up to 50% in installation costs.
- Easily move peripherals with minimal disruption.
- If LAN is protected from power failure by a UPS, the PoE devices connected to your LAN are also protected from power failure.
- Safety – no mains voltages usage, only safe direct current levels (SELV).
- As PoE becomes more common, the 8-pin modular connector will become the industry-standard power jack.
- Central management – by adding low-voltage peripherals to the Ethernet network, everything from control touch panels to the HVAC system can be accessed and controlled over your network.
- Inexpensive to implement. PoE is an extension of the Ethernet standard, meaning it is universal and inexpensive.
- It is easy – most people already know how Ethernet works.

PoE Standards

The most popular PoE standards are IEEE 802.3af (PoE) and IEEE 802.3at (PoE+, PoE Plus) specifications, which describes Ethernet Power Sourcing Equipment (PSE) and Powered Device (PD). The specifications are compatible with standard Ethernet UTP hardware, including patch panels and outlets, without requiring modification.

The PoE standard equipment contains a detection mechanism to prevent sending power to noncompliant devices – only the devices that present a PoE signature receive power. If a non-PoE device is accidentally plugged in, it will not receive power and will not be damaged. This power detection mechanism also provides optional means of identifying the amount of power required by each device.

The IEEE specification defines PSE as the element responsible for inserting power onto a Ethernet cable. The PD is the natural termination of this link, receiving the power.

The following table describes basic properties of both standards.

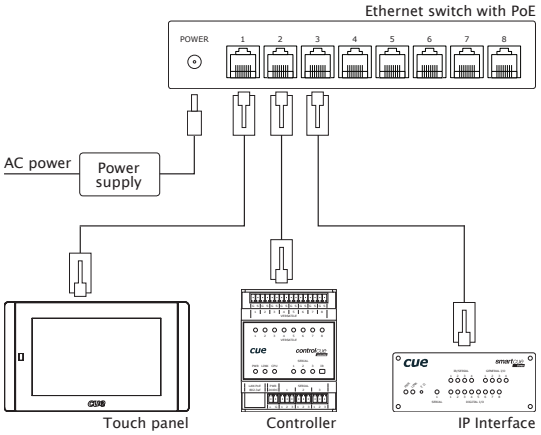
Property	IEEE 802.3af (802.3at Type 1)	IEEE 802.3at Type 2
Power available at PD	12.95 W	25.50 W
Maximum power delivered by PSE	15.40 W	34.20 W
Voltage range (at PSE)	44.0 ÷ 57.0 V	50.0 ÷ 57.0 V
Voltage range (at PD)	37.0 ÷ 57.0 V	42.5 ÷ 57.0 V
Maximum current	350 mA	600 mA
Maximum cable resistance	20 Ω (Category 3)	12.5 Ω (Category 5)
Power management	Three power class levels negotiated at initial connection	Four power class levels negotiated at the initial connection or 0.1 W steps negotiated continuously
Supported cabling	Category 3 or better	Category 5 or better
Maximum cable length	100 m	100 m
Supported modes	Mode A (endspan), Mode B (midspan)	Mode A (endspan), Mode B (midspan)

PoE System Architecture

There are two basic types of PSE:

- The Endspan PSE integrates PoE into Ethernet switches.
- The Midspan PSE is an element which resides between the switch and the terminal, providing power only.

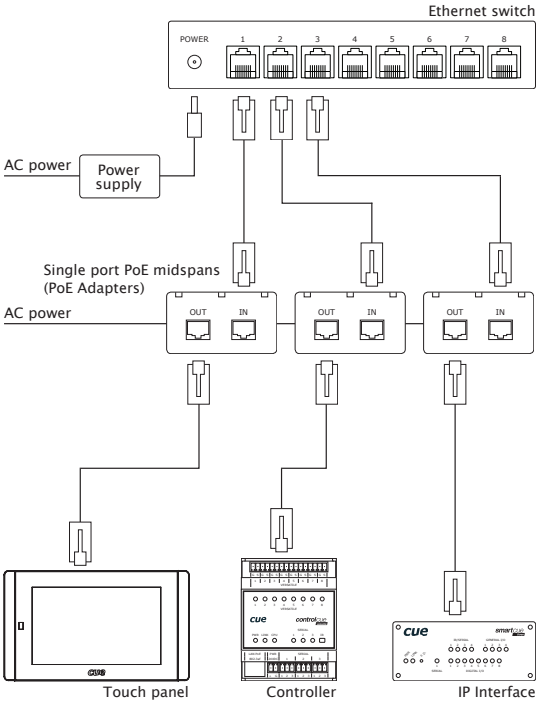
Endspan PSE Configuration



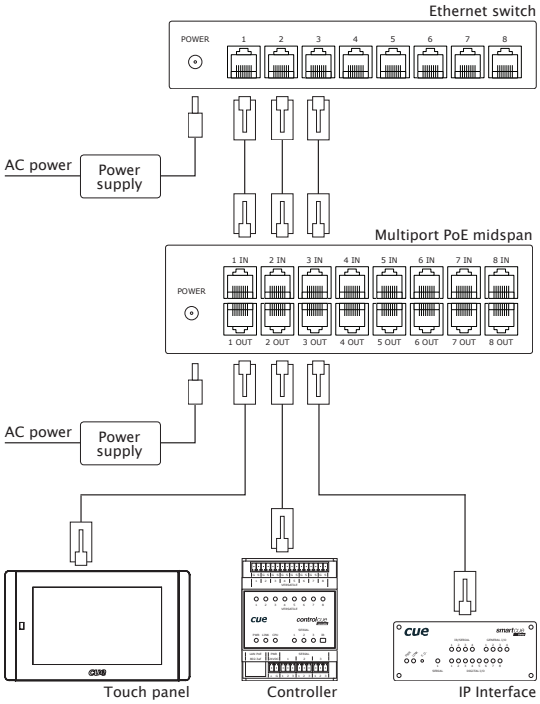
The Endspan is a switch that integrates the PoE source to simplify the infrastructure, using "Phantom Feeding" on the center tap of the Ethernet pulse transformer. 802.3af enables the Endspan to use the spare pairs for power delivery instead of the data pairs, though the latter configuration is more commonly used

Midspan PSE Configuration

Singleport Midspans (PoE Adapters) is a power-supply-like device that receives data lines from the switch and inserts power over the spare pairs, providing data and power out to the PD.



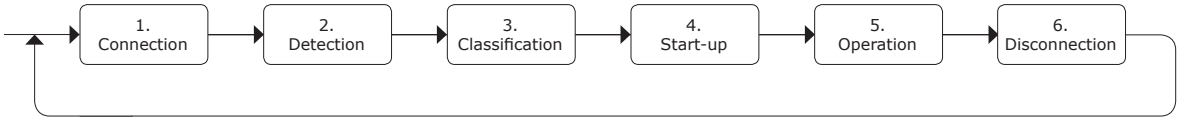
The Multiport Midspan is a patch-panel-like device that receives data lines from the switch and inserts power over the spare pairs, providing data and power out to the PD.



The PoE Provision Process

While adding PoE support to network devices is relatively painless, it is necessary to bear in mind that power cannot simply be transferred over the existing Cat-5 cables. Without proper preparation, doing so may result in damage to devices that are not designed to support provision of power over their network interfaces.

The PoE power provisioning cycle is provided in following steps:



1. Connection.
2. In the beginning, only small voltage level is induced on the port output, till a valid PD is detected during the Detection period.
3. The PSE may choose to perform classification in order to estimate the amount of power to be consumed by the PD.
4. The time-controlled start-up.
5. The PSE begins supplying the 48 VDC level to the PD till it is physically or electrically disconnected.
6. Upon disconnection, voltage and power shut down. Right afterwards, the cycle is restarted.

Several incidents such as consumption overload, short circuit, out-of-power-budget and other scenarios may terminate the process in the middle, only to restart it from phase (1.) again.

Since the PSE is responsible for the PoE process timing, it is the one generating the probing signals prior to operating the PD and monitoring the various scenarios that may occur during operation. All probing is done using voltage induction and current measurement in return.

Power Supply 24 VDC

Overview

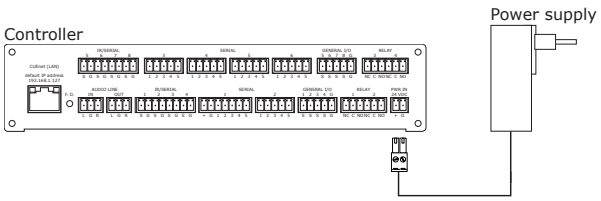
The standard power adapters are delivered with each unit. CUE delivers 3 models of standard power supplies and 2 models of DIN rail models as described in the following table.

Use any unit only with the power adapter supplied in the product package. Using another power supply may damage the unit.

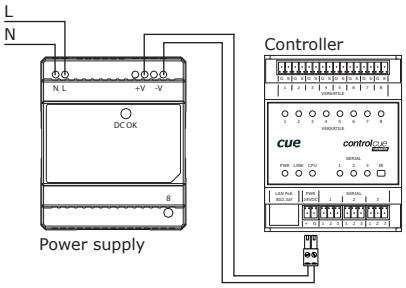
	CUEadapter-24J24	CUEadapter-24P24	CUEadapter /65W	CUEadapter-24DIN30	CUEadapter-24DIN60
Product code	CS0436	CS0437	CS0293	CS0367	CS0368
Description	AC/DC switching mode power supply	AC/DC switching mode power supply	AC/DC switching mode power supply	AC/DC switching mode power supply	AC/DC switching mode power supply
Output	24 VDC / 24 W	24 VDC / 24 W	24 VDC / 65 W	24 VDC / 30 W	24 VDC / 60 W
Connector	Power Jack	2-pin, 3.5 mm	2-pin, 5 mm	Terminals	Terminals
Power supply	90 to 240 VAC	90 to 240 VAC	100 to 240 VAC	85 to 264 VAC	88 to 264 VAC
Enclosure	Plastic	Plastic	Plastic	Plastic, DIN rail compatible	Plastic, DIN rail compatible
Dimensions	94 x 46 x 36 mm	94 x 46 x 36 mm	114 x 54 x 34 mm	78 x 93 x 56 mm	78 x 93 x 56 mm
Weight	0.2 kg	0.2 kg	0.3 kg	0.3 kg	0.3 kg

Connection

Standard Power Supply



DIN Rail Power Supply



Connector Pin-out

PWR IN			
2-pin 3.5 mm	2-pin 5 mm	Pin	Description
+ G	+ G	+	Power +24 VDC
		G	Ground

PoE / 24 VDC Power Supply

Overview

The following controllers

- controlCUE-versatile-d
- controlCUE-dali-d
- controlCUE-knx-d
- controlCUE-dmx-d
- controlCUE-poseidon-d

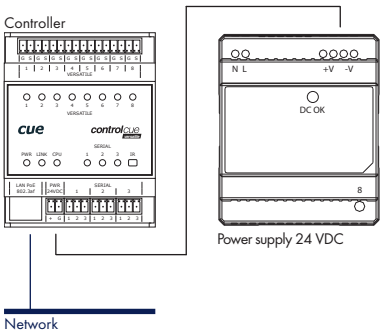
have two power supply possibilities:

- Power over Ethernet, IEEE 802.3af compatible
- 24 VDC.

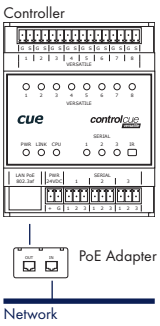
Connection

For connection to a network without PoE infrastructure, the local power supply can be used. There are two possibilities as described in the following pictures. Both methods mean that local power is independent of the central power source. It can increase the reliability of distributed systems, because local functions are independent of the central power supply.

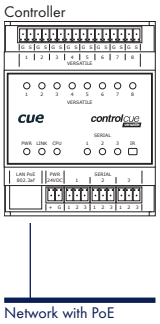
Power supply 24 VDC



PoE Adapter



The integrated PoE allows easy installation in areas where PoE network infrastructure is installed. It means the controller power supply depends on the central PoE power supply. It can decrease the reliability of distributed systems, because local functions depend on the central power supply.



Control Ports

Units by Control Ports

The following table describes the control ports of all CUE products.

Units	Control ports																				
	IP	Serial RS-232	Serial RS-485	Serial RS-232/485	Serial RS-232/422/485	IR/Serial output	Versatile	General I/O	Digital I/O	Contact input	Local control input	Analog output	Low-voltage relay	High-voltage relay	DALI	KNX	DMX512	Enika Poseidon	DSI	Temperature sensor	Light sensor	Dimming output
Touch Panels																						
airCUE-7	1																					
touchCUE-5, -5-B	1																					
touchCUE-7, -7-B, -7-W	1																					
touchCUE-12, -12-B, -12-W	1																					
Touch Panel Controllers																						
uniCUE-7-B	1				2	4		4					2									
uniCUE-12-B	1				2	4		4					2									
Controllers																						
controlCUE-one	1				2	4		4					2									
controlCUE-two	1				6	8		8					4									
controlCUE-versatile-d	1			3			8															
controlCUE-dali-d	1			1			4								1							
controlCUE-knx-d	1			1			4									1						
controlCUE-dmx-d	1			1			4										1					
controlCUE-poseidon-d	1			1			4											1				
ipCUE-alpha	1	2	1		4	8		8					2									
ipCUE-beta	1	2	1			8																
ipCUE-epsilon	1	2	1			8		8				4	8									
ipCUE-delta	1	2	1		4	8		8				4	16									
ipCUE-gamma	1	2	1			2		8					2									
ipCUE-sigma	1				4	3		8	12					8								
IP Interfaces																						
smartCUE-zero		1			1				4													
smartCUE-one		1							8													
smartCUE-two		1							8				6									
smartCUE-three		1				4		4	8													
smartCUE-zero-wifi		1			1				4													
smartCUE-one-wifi		1							8													
smartCUE-two-wifi		1							8				6									
smartCUE-three-wifi		1				4		4	8													
Interfaces																						
sensorCUE																				1	1	
sensorCUE-W																				1	1	
inputCUE										8												
inputCUE-W										8										1		
PEA208											4	2		2								
KNXgw232																1						
sbiCUE-DMX																	1					
PEF150											4				1							
PEF200											4								2			
Power Switching Units																						
relayCUE-8											8			8								
powerAUX														8								
PER610											6			6								
Dimmers																						
PED108											2											1
PED202											4											2
PET102											2											1
PET105											2											1

Network

Overview

The network control port can be implemented by

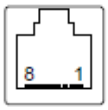
- Wired 10/100 BaseT Ethernet
- Wi-Fi.

Any CUEunit equipped with network communication can be used as a controller with IP control ports.

For more information about control over IP network, see the chapter Network Control.

Wired 10/100 BaseT Ethernet

The 10/100 BaseT Ethernet is a standard network connection using the RJ-45 connector. The length of the Ethernet cable connecting controller to the network must not exceed 100 meters.

RJ-45	Pin	Signal	Cat5 Cable Color
	1	TX_D1+ and PoE	White / Orange
	2	TX_D1- and PoE	Orange
	3	RX_D2+ and PoE	White / Green
	4		Blue
	5		White / Blue
	6	RX-D2- and PoE	Green
	7		White / Brown
	8		Brown

Wi-Fi

The Wi-Fi is a standard wireless network IEEE 802.11b/g Wi-Fi 2.4 GHz.

Serial

Overview

This type of port provides connection to controlled devices through RS-232/422/485.

For more information on control through serial ports, see the chapter Serial Controlled Devices.

Bi-directional Serial RS-232/422/485

Overview

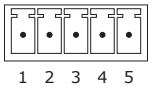
These bi-directional serial channels are used for RS-232, RS-422 and RS-485 communication.

Baud rate can be set to the following values: 300, 600, 1 200, 2 400, 4 800, 9 600, 19 200, 38 400, 57 600 and 115 200 Bd (bps). In addition, smartCUE interfaces can use baud rates 230 400 and 460 800 Bd (bps).

Default mode for all channels is RS-232, other modes must be set in the programmed application. For more details see the programming manuals.

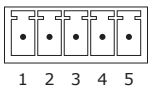
RS-232 Mode

Output signal levels for RS-232 are in the -10 V to +10 V range. This is default mode for all channels.

5-pin 3.5 mm	Pin	Signal	Description	Direction
	1	TxD	RS-232 Transmitted Data	From the unit
	2	RTS	RS-232 Request to Send	From the unit
	3	GND	Ground	
	4	RxD	RS-232 Received Data	To the unit
	5	CTS	RS-232 Clear to Send	To the unit

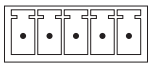
RS-422 Mode

This mode must be set in the programmed application.

5-pin 3.5 mm	Pin	Signal	Description	Direction
	1	Tx A+	RS-422 Transmit Data (Idles High)	From the unit
	2	Tx B-	RS-422 Transmit Data (Idles Low)	From the unit
	3	GND	Ground	
	4	Rx A+	RS-422 Receive Data (Idles High)	To the unit
	5	Rx B-	RS-422 Receive Data (Idles Low)	To the unit

RS-485 Mode

This mode must be set in the programmed application.

5-pin 3.5 mm	Pin	Signal	Description
	1	A+	RS-485 Data +
	2	B-	RS-485 Data -
	3	GND	Ground
	4	N.C.	Not Connected
	5	N.C.	Not Connected

Bi-directional Serial RS-232/485

Overview

This bi-directional serial channel is used for RS-232 and RS-485 communication. Baud rate can be set to the following values: 300, 600, 1 200, 2 400, 4 800, 9 600, 19 200, 38 400, 57 600 and 115 200 Bd (bps). Default mode for the channel is RS-232, the RS-485 mode must be set in the programmed application. For more details see the programming manuals.

RS-232 Mode

Output signal levels for RS-232 are in the -6 V to +6 V range. This is default mode for all channels.

5-pin 3.5 mm	Pin	Signal	Description	Direction
1 2 3	1	TxD	RS-232 Transmitted Data	From the unit
	2	RxD	RS-232 Received Data	To the unit
	3	GND	Ground	

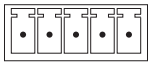
RS-485 Mode

This mode must be set in the programmed application.

5-pin 3.5 mm	Pin	Signal	Description
1 2 3	1	A+	RS-485 Data +
	2	B-	RS-485 Data -
	3	GND	Ground

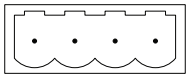
Bi-directional Serial RS-232

This bi-directional serial channel is used for RS-232 communication. Output signal levels are in the -12 V to +12 V range. Baud rate can be set to the following values: 300, 600, 1 200, 2 400, 4 800, 9 600, 19 200, 38 400, 57 600 and 115 200 Bd (bps). In addition, smartCUE interfaces can use baud rates 230 400 and 460 800 Bd (bps).

5-pin 3.5 mm	Pin	Signal	Description	Direction
 1 2 3 4 5	1	TxD	RS-232 Transmitted Data	From the unit
	2	RTS	RS-232 Request to Send	From the unit
	3	GND	Ground	
	4	RxD	RS-232 Received Data	To the unit
	5	CTS	RS-232 Clear to Send	To the unit

Bi-directional Serial RS-485 with Power 24 VDC (CUEwire)

This mode is suitable for the connecting of CUEwire devices and it must be set in the programmed application. This mode can also be used for general RS-485 communication and must be set in the programmed application.

5-pin 3.5 mm	Pin	Signal	Description
 +24 G A+ B-	+24	+24	Power +24 VDC
	G	GND	Ground
	A+	A+	RS-485 Data +
	B-	B-	RS-485 Data -

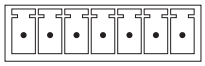
Bi-directional Serial RS-232/422/485 with Power 24 VDC

Overview

This bi-directional serial channel is used for RS-232, RS-422 and RS-485 communication and for the power supply of 24 VDC and is applicable as SERIAL 1. The maximum speed is 115 200 Bd (bps). The default mode for all channels is RS-232, other modes must be set in the programmed application. For more details see the programming manuals.

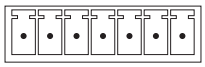
RS-232 Mode

Output signal levels for RS-232 are in the -10 V to +10 V range. This is default mode.

7-pin 3.5 mm	Pin	Signal	Description	Direction
	+24	+24	Power +24 VDC	
	G	GND	Ground	
	1	TxD	RS-232 Transmitted Data	From the unit
	2	RTS	RS-232 Request to Send	From the unit
	3	GND	Ground	
	4	RxD	RS-232 Received Data	To the unit
	5	CTS	RS-232 Clear to Send	To the unit

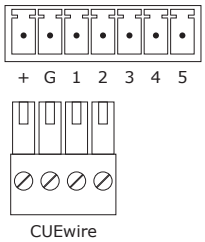
RS-422 Mode

This mode must be set in the programmed application.

7-pin 3.5 mm	Pin	Signal	Description	Direction
	+24	+24	Power +24 VDC	
	G	GND	Ground	
	1	Tx A+	RS-422 Transmit Data (Idles High)	From the unit
	2	Tx B-	RS-422 Transmit Data (Idles Low)	From the unit
	3	GND	Ground	
	4	Rx A+	RS-422 Receive Data (Idles High)	To the unit
	5	Rx B-	RS-422 Receive Data (Idles Low)	To the unit

RS-485 Mode (CUEwire)

This mode is suitable for the connecting of CUEwire devices and must be set in the programmed application. This mode can also be used for general RS-485 communication and must be set in the programmed application.

7-pin 3.5 mm	Pin	Signal	Description
	+24	+24	Power +24 VDC
	G	GND	Ground
	1	A+	RS-485 Data +
	2	B-	RS-485 Data -
	3	GND	Ground
	4	N.C.	Not Connected
	5	N.C.	Not Connected

IR/Serial Output

Overview

This type of port provides

- Output for infra-red emitters (IR Adapter /i, IR Sprayer), maximum IR output rate is 1.2 MHz.
- RS-232 serial output (one-way), maximum serial data rate is 115 200 Bd (bps), output signal levels for RS-232 are in the -12 V to +12 V range.

The IR outputs and RS-232 outputs can be combined on independent ports (for example three ports can be used as IR, five ports can be used as RS-232).

2-pin 3.5 mm	Pin	Signal	Description
	S	Signal	IR/Serial Signal (Output)
	G	GND	Ground

IR Output

Overview

This mode provides output for infra-red emitters IR Adapter /i. In addition, the port can drive the IR Sprayer powered by external power supply.

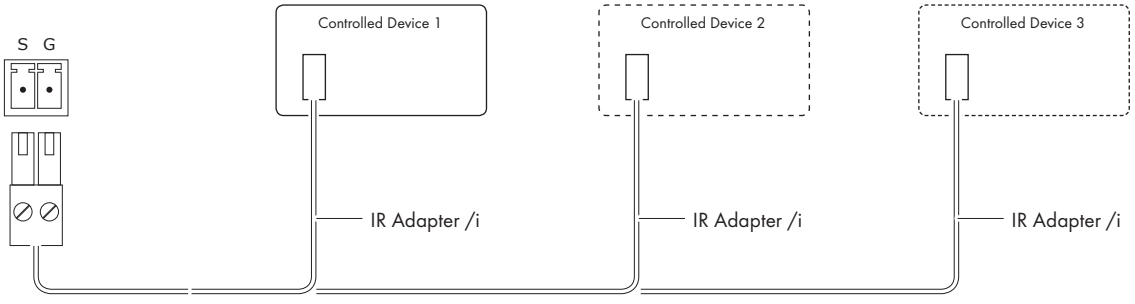
Parameters of IR output are as follows:

- Maximum IR output rate is 1.2 MHz.
- Up to three original infra-red emitters IR Adapter /i can be connected to each output in parallel. All emitters send the same IR codes. This configuration can be used for different types of devices.
- Up to ten IR Sprayers with external power supply can be connected to each output in parallel.

Warnings

- It is not recommended to connect more infra-red emitters of various manufacturers in parallel because the output can be either overloaded or damaged.

Connecting



Serial Output

Overview

This mode provides one-way RS-232 output channel.

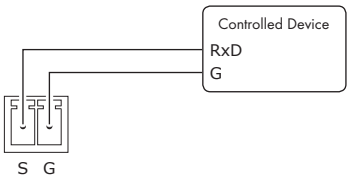
The parameters of serial output are as follows:

- Maximum serial data rate 115 200 Bd (bps)
- Output signal level range is -12 V to +12 V.

Warnings

- In case there are more ports in the unit, all pins labelled G are connected together.

Connecting



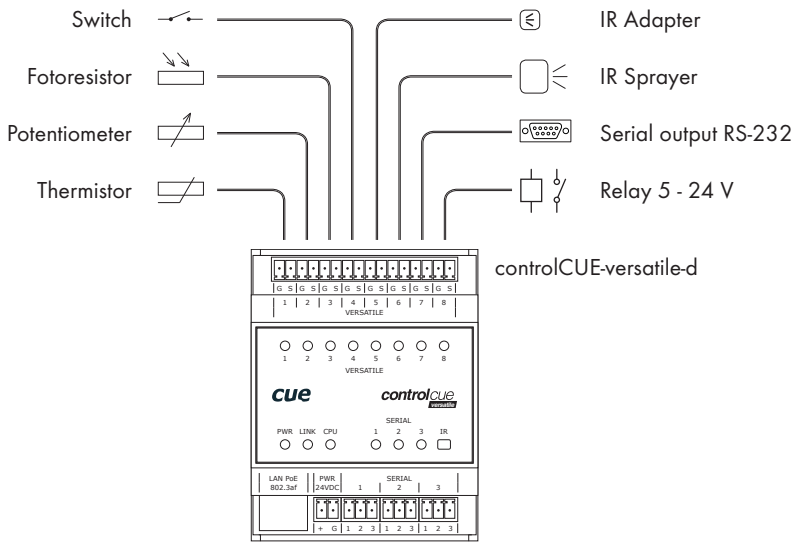
Versatile

Overview

Depending on the application, the versatile port can be used in multiple ways.

1. Analog input can sense digital signals (contact closure, switches, relays, logic level signals from motion detectors, partition sensors, alarm panels, triggers, energy meters, etc.) as well as analog signals (DC voltage level or changes in a resistance from volume control potentiometers, temperature and light sensors, water level meters, etc.).
2. Digital output provides on/off closure signal for driving a relay and trigger inputs from a variety of devices.
3. IR output provides output for infra-red emitters.
4. Serial output provides one-way RS-232 channel.

Application diagram



Warnings

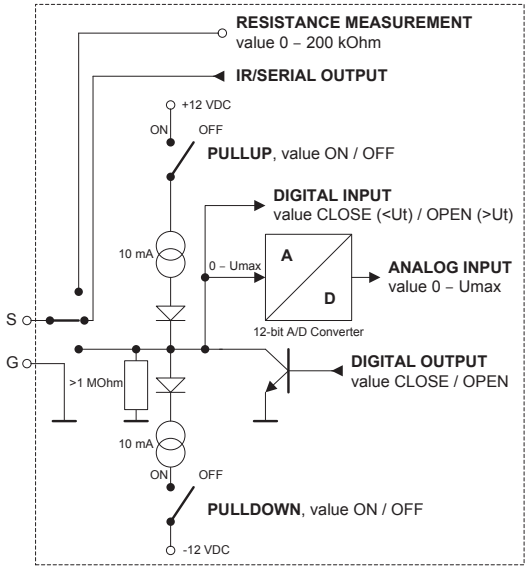
- Incorrect wiring may damage the versatile port or the connected device.
- All versatile ports in the unit have common ground which is connected to the grounds of other control ports. That means versatile ports are not isolated from other control ports.

Connector pin-out

2-pin 3.5 mm	Pin	Signal	Description
S G	S	Signal	Signal
	G	GND	Ground

Analog Input and Digital Output

The following picture describes the connection of versatile port for analog input and digital output usage.

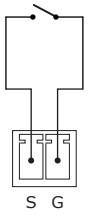
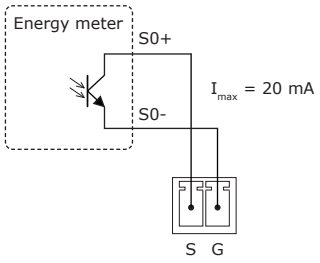


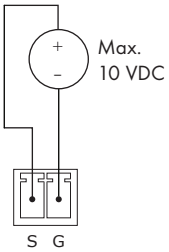
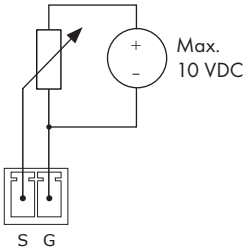
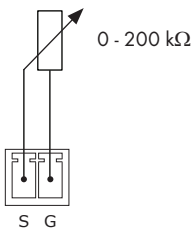
Analog Input

For analog input usage the output has to be in an open state and the pull-up current source can be used. Parameters of analog input are as follows:

- Rated for 0 – 10 VDC
- Protected to 30 VDC maximum
- Input impedance >1 MΩ
- 12-bit A/D converter
- Switchable current-source pull-up 10 mA / max. 12 V.

The following table describes how to use analog input.

	Detecting a pushbutton or contact	Energy meters S0 interface pulse counter
		
Usage	Any button or contact closure	Pulse outputs from third-party energy meters. S0 interface defines a simple galvanically isolated open-collector output channel.

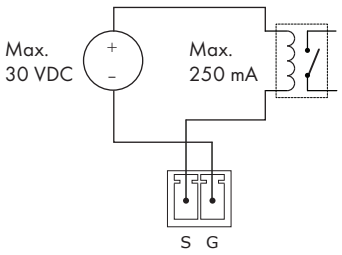
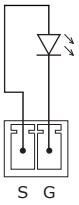
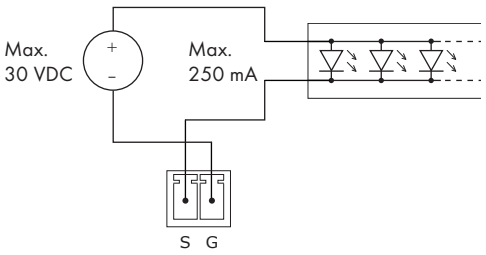
	Detecting a voltage	Reading voltage	Reading resistance
			
Usage	Sensors with voltage output 0 – 10 VDC	Potentiometer with external power supply	Room potentiometer for light, temperature and volume control

Digital Output

For digital output the open collector switch is used and the pull-up resistor can be switched on. Parameters of digital output are as follows:

- 250 mA sink from maximum 30 VDC
- Catch diodes for use with real loads
- Switchable current-source pull-up 10 mA / max. 12 V.

The following table describes how to use digital output.

	Driving a relay coil	Driving LED indicator	Driving LED strip
			
Usage	Driving relays with low-voltage coil	Driving LEDs for custom indicators on keyboards, control panels, etc.	Driving LED strips with max. voltage 30 VDC and max. current 250 mA.

IR Output

Overview

This mode provides output for infra-red emitters IR Adapter /i. In addition, the port can supply IR Sprayer without necessity to use external power supply.

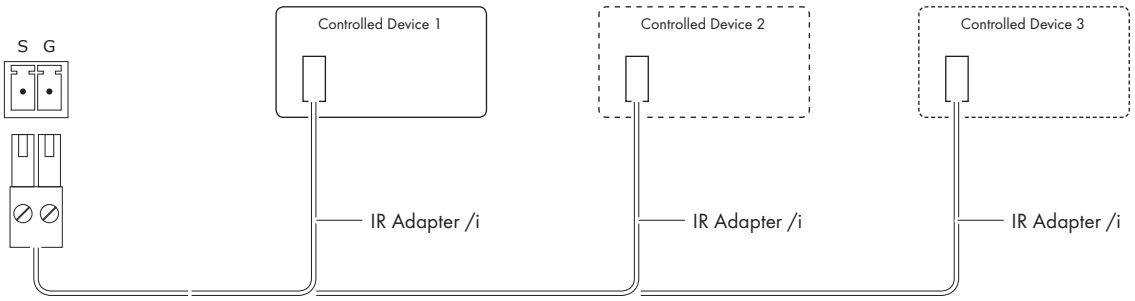
Parameters of IR output are as follows:

- Maximum IR carrier frequency 500 kHz
- Up to three original infra-red emitters IR Adapter /i can be connected to each output in parallel. All emitters send the same IR codes. This configuration can be used for different types of devices.
- Up to ten IR Sprayers with external power supply can be connected to each output in parallel.

Warnings

- It is not recommended to connect more infra-red emitters of various manufacturers in parallel because the output can be either overloaded or damaged.

Connecting



Serial Output

Overview

This mode provides one-way RS-232 output channel.

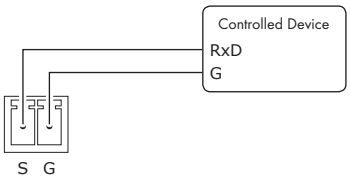
Parameters of serial output are as follows:

- Maximum serial data rate 115 200 Bd (bps)
- Output signal level range is -12 V to +12 V.

Warnings

- In case there are more ports in the unit, all pins labelled G are connected together.

Connecting

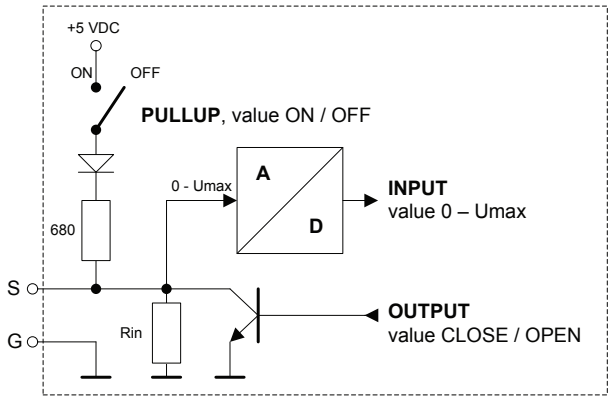


General I/O

Overview

General I/O provides analog input as well as digital output. Each General I/O port can be used either as input or as output.

Schematic diagram



Analog Input

For analog input usage the output has to be in open status and pull-up resistor can be used. Parameters of analog input are as follows:

- The rate depends on specific unit as described in the following table.

	Maximum input voltage U_{max}	Input resistance R_{in}	A/D converter
ipCUE-alpha, ipCUE-gamma, ipCUE-delta, ipCUE-epsilon	5 V	510 kΩ	10-bit (i.e. 1024 levels)
ipCUE-sigma	20 V	210 kΩ	10-bit (i.e. 1024 levels)
controlCUE-one, controlCUE-two, uniCUE-7-B, uniCUE-12-B	5 V	66 kΩ	10-bit (i.e. 1024 levels)
smartCUE-three, smartCUE-three-wifi	20 V	26 kΩ	12-bit (i.e. 4096 levels)

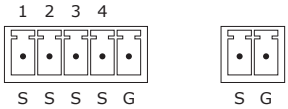
- Programmable 5 Volts 680 Ω pull-up can be switched on and off for each I/O independently. I/O voltage with pull-up on is approx. +4.3 VDC, because the protection diode is connected in series (0.7 V dropdown).

Digital Output

For digital output the open collector switch is used and the pull-up resistor can be switched on. Parameters of digital output are as follows:

- Max. 80 mA sink from maximum 24 VDC
- Output voltage for closed output switch is approx. 0.6 V.
- Programmable 5 Volts 680 Ω pull-up can be switched on and off for each I/O independently. I/O voltage with pull-up on is approx. +4.3 VDC, because protection diode is connected in series (0.7 V dropdown).

Connector pin-out

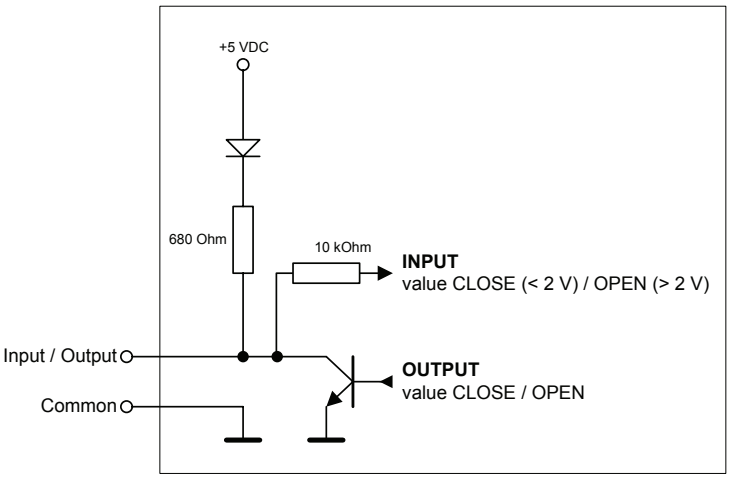
5-pin or 2-pin 3.5 mm	Pin	Signal	Description
	S	Signal	Input / Output Signal 1 – 4
	G	GND	Common ground for all I/Os

Digital I/O

Overview

Digital I/O provides digital input as well as digital output. Each Digital I/O port can be used either as input or as output.

Schematic diagram



Digital Input

For digital input usage the output has to be in an open state and pull-up resistor can be used. Parameters of digital input are as follows:

- Rated 0 – 24 VDC
- Threshold voltage 2 V
- Pull-up resistor 680 Ω is connected to +5 VDC.

Digital Output

For digital output the open collector switch is used and pull-up resistor can be switched on. Parameters of digital output are as follows:

- Max. 80 mA sink from maximum 24 VDC
- Output voltage for closed output switch is approx. 0.6 V.
- 5 Volts 680 Ω pull-up is used. When output is opened the I/O voltage is approx. 4.3 VDC, because the protection diode is connected in series (0.7 V dropdown).

Connector pin-out

5-pin or 13-pin 3.5 mm	Pin	Signal	Description
1 2 3 4 G S S S S G	S	Signal	Input / Output Signal 1 – 4, 5 – 8, 1 – 12
1 2 3 4 5 6 7 8 9 10 11 12 G S S S S S S S S S S S S G	G	GND	Common ground for all I/Os

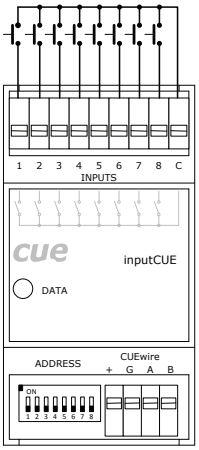
Contact Input

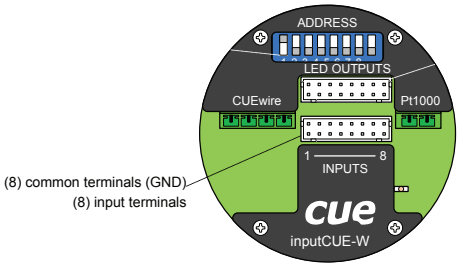
Overview

This control port allows to connect potential free contact.

Connector pin-out

Connector pin-out for this port is not standard and varies according to unit as described below.





For more details see the documentation for the specific unit.

Pt1000

Overview

This control port provides two-wire connection of the Pt1000 temperature sensor.

For more details on temperature measurement see chapter Sensors and Detectors / Temperature.

Connector pin-out

2-pin 3.5 mm	Pin	Description
1 2	1	Temperature sensor wire 1
	1	Temperature sensor wire 2

Analog Output

Overview

Analog output provides analog output of 0 – 10 V. When connecting with another device (dimmer, ballast, LED driver, etc.), it is essential to see to a perfect interconnection with earth. The output voltage generated by the analog output is mutually related to the reference level (ground) on the pin labelled G.

Parameters

- Range of the output voltage 0 – 10 V
- Max. current 10 mA (both source and sink)
- Stepping regulation (LSB) 39 mV
- Min. set-up precision ± 0.08 V (± 2 LSB)

Connector pin-out

2-pin 3.5 mm	Pin	Signal	Description
S G	S	Signal	Analog output signal 0 – 10 V
	G	GND	Ground

Notes

- In case there are more analog outputs in the unit, all pins labelled G are connected together.

Relay

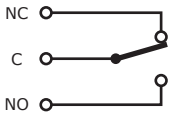
Low-Voltage Relay

Overview

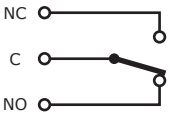
This port provides one isolated low-voltage relay. Each relay contact closure is rated 24 V / 0.5 A.

Normally Close (NC) and Normally Open (NO) contacts as well as the Common (C) contact of each relay can be used. The Normally Close (NC) position is the state of the relay when it is not turned on (energized).

Relay open



Relay close



Connector pin-out

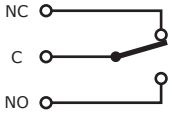
3-pin 3.5 mm	Pin	Description
NC C NO	NC	Relay contact Normally Close
	C	Relay contact Common
	NO	Relay contact Normally Open

High-Voltage Relay

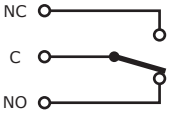
Overview

This port provides one isolated high-voltage relay. Normally Close (NC) and Normally Open (NO) contacts as well as Common contact (C) of each relay can be used. The normal position is the state of the relay when it is not turned on (energized). Some relays have Common (C) and Normally Open (NO) contacts only.

Relay open



Relay close



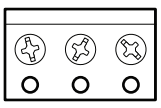
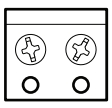
Relay open

Relay close

Parameters

Relay parameters and maximum switching loads depend on a specific unit and the type of the loads. These parameters are different for resistive, capacitive and inductive loads. For more details see the appropriate chapters in this document where switching, motor control and lighting control are described.

Connector pin-out

3-pin screw terminal 1.5 mm²	2-pin screw terminal 1.5 mm²	Pin	Description
 NC C NO	 C NO	NC	Relay contact Normally Close
		C	Relay contact Common
		NO	Relay contact Normally Open

DALI

Overview

This galvanically isolated port provides connection to DALI (Digital Addressable Lighting Interface). The port does not provide DALI power supply which must be ensured by external DALI power source. DALI units are equipped with a diode bridge so that devices can be wired regardless of the cable polarity.

DALI is a data protocol and transport mechanism that was jointly developed and specified by several manufacturers of lighting equipment. The DALI standard is specified in the 60929 IEC standard. The DALI protocol allows for the maximum of 64 fittings on a single network and the network can be divided into up to 16 different possible areas.

For more details about DALI interfacing, see the chapter Standard Buses / DALI.

Connector pin-out

Terminal block 2 x 4	Pin	Description
	DA	DALI signal
	DA	DALI signal

KNX

Overview

This galvanically isolated port provides connection to the KNX bus.

For more details about KNX interfacing, see the chapter Standard Buses / KNX.

Connector pin-out

Terminal block 2 x 4	Pin	Description
	-	KNX bus -
	+	KNX bus +

DMX512

Overview

DMX512 employs EIA-485 differential signalling at its physical layer, in conjunction with a variable-size, packet-based communication protocol. It is unidirectional.

The unit equipped with DX512 input and output ports can work in three basic modes.

1. The unit is the master control unit of the DMX512 bus. Only DMX output of the unit is functional in this mode.
2. This mode is useful if there is some master controller of the DMX512 bus, for example a stage console. In this mode it is possible to use the unit to read the levels of particular channels pushed from the DMX512 control console to the DMX input, change it and send the new values to the lights.
3. This mode can be used in the same hardware configuration as in Mode 2, but in this case the unit only re-sends commands from the master DMX console unchanged to the DMX output.

For more details about DMX512 implementation see the chapter Standard Buses / DMX512.

Input connector pin-out

3-pin 3.5 mm	Pin	Description
D+ D- C	D+	Data +
	D-	Data -
	C	Signal Common

Output connector pin-out

3-pin 3.5 mm	Pin	Description
D+ D- C	D+	Data +
	D-	Data -
	C	Signal Common

DSI

Overview

DSI (Digital Serial Interface) is a protocol for the controlling of lighting in buildings – originally electrical ballasts. The technology uses a single byte to communicate the lighting level. The maximum of 50 ballasts can be connected to each DSI output.

For more information see the chapter Standard Buses / DSI.

Connector pin-out

Terminal	Pin	Description
O1 O2	O1	Output 1
	O2	Output 2

Dimming Output

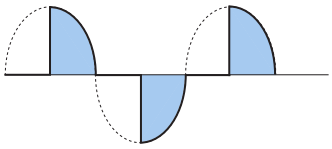
Introduction

Each type of lighting source (load types) has its own individual characteristics, which require special types of dimmers. It is important to use a dimmer that is designed for the given lighting source (load type). The following table describes two basic types of dimmers.

For more information about light dimming, see the chapter Lighting Control / Dimming Lights.

The Cue System offers the following dimming outputs:

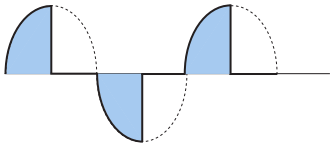
Forward Phase Control

Leading edge	Description	Applications
	The dimmer does not provide power until sometime later into the line cycle. Once the dimmer starts to provide power, it will do so until the zero cross. Dimming is achieved by delaying the time at which the dimmer starts conducting.	Resistive and inductive loads (RL) Magnetic low-voltage transformers

Compatible dimmers

- PED108
- PED202

Reverse Phase Control

Trailing edge	Description	Applications
	The dimmer starts to provide power immediately after the zero cross. Dimming is achieved by delaying the time at which the dimmer stops conducting.	Resistive and capacitive loads (RC) Electronic low-voltage transformers

Compatible dimmers

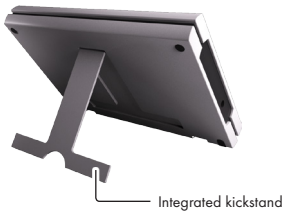
- PET102
- PET105

User Interfaces

Wireless Touch Panel

Introduction

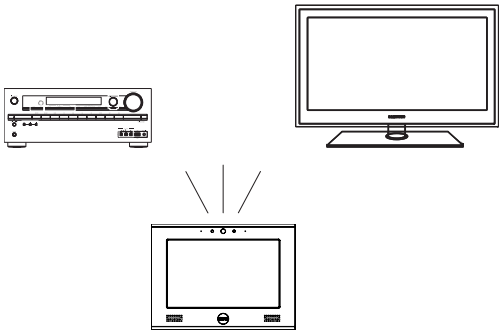
The airCUE-7 is wireless touch panel. The 7" active matrix touch screen display offers the resolution 800 x 480 pixels and produces stunning true color images. The wireless network Wi-Fi communication provides easy network integration.



The touch panel wakes its display automatically without any physical contact if the motion sensor detects the presence of nearby. The auto-brightness functionality intelligently adjusts the brightness of the display based on the ambient light to make reading comfortable. The streaming video ability makes it possible to view security cameras and other video sources over the network. The touch panel supports MJPEG and H.264 formats. The audio files stored in the touch panel or the streaming audio can be used as button feedback, voice prompts, etc. The voice from the built-in microphone can be stored and played.

The case is machined from a single billet of aluminium, increasing weight but greatly improving the rigidity of the device.

The built-in IR transmitter can be used for direct IR-controlled devices and the receiver serves for IR capture.



The internal Li-Ion rechargeable battery pack is charged by

- Tabletop Charging Station (included accessories)
- Wall Charging Station available (has to be ordered separately)

Tabletop Charging Station

Wall Charging Station

Resources

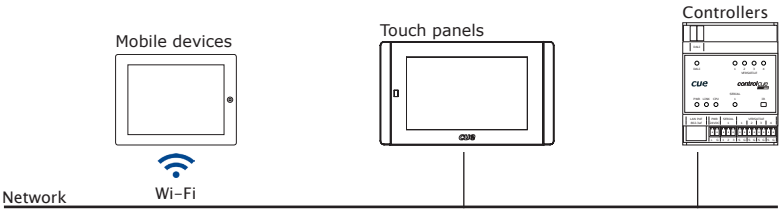
http://www.cuesystem.com/wireless_touch_panels_cuenium2.aspx

Mobile Devices

Introduction

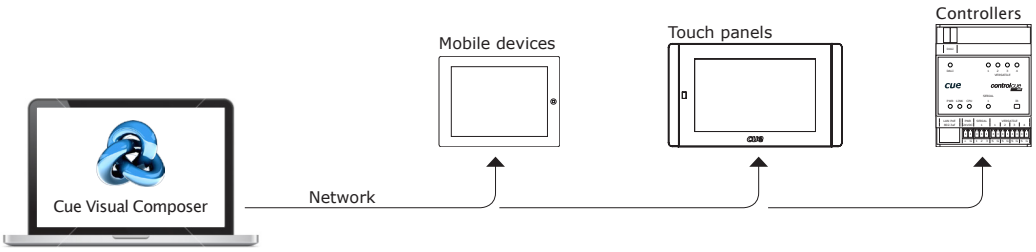
CUE's mobile device applications (runtimes) allow anyone to control and manage any infrastructure based on the Cue System scalable architecture from iOS, Android and Windows devices.

The mobile applications communicate via Wi-Fi or wired network with the Cue System infrastructure backbone. The infrastructure is defined by CUE controllers.



Runtimes are Apple iOS / Android / Windows applications designed to support the execution of programs written in XPL^2 language using Cue Visual Composer. The runtimes contain implementations of XPL^2 commands accessible to the programmer through the XPL^2 Application Programming Interface (API). That means applications for Apple iOS / Android / Windows devices are programmed by the same tools as the rest of the system (touch panels, controllers) and they are fully integrated with CUE products.

The finished application is then uploaded to a mobile device using standard network (Wi-Fi) connection as described in the following picture.

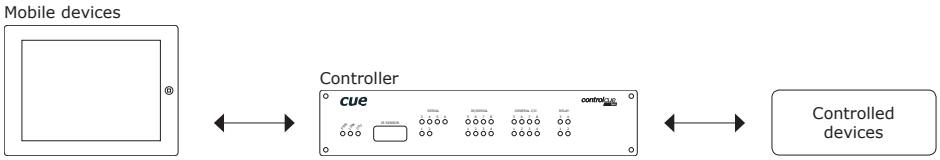


Runtime Versions

Two versions of runtimes are available for all operating systems mentioned above.

Standard

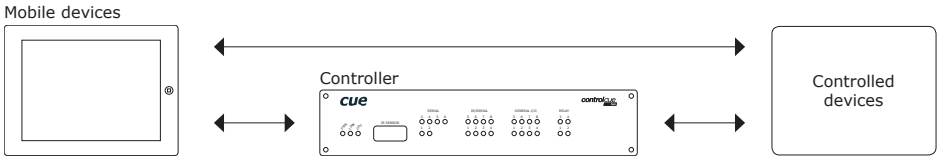
The basic standard version communicates with CUE controllers and touch panels only, which means it can be used as a control panel.



Professional

The professional version offers the same functionality as the standard version plus any IP operated device can be controlled directly without the need of control unit, because the complete set of XPL[2] IP commands can be used. With the professional version you can create applications without the necessity to use a controller.

The professional version can combine both the communication with the controllers and the direct control of the IP operated devices.



Runtimes Overview

Available runtimes are described in the following table.

Operating System	Product Name	Product Code	Full set of CVC graphic features	Ethernet and Wi-Fi communication	CUEunits system communication	IP commands for device control
Apple iOS	iCUE-standard	CS0428	•	•	•	
	iCUE-professional	CS0429	•	•	•	•
Android	aCUE-standard	CS0426	•	•	•	
	aCUE-professional	CS0427	•	•	•	•
Windows	pcCUE-standard	CS0405	•	•	•	
	pcCUE-professional	CS0406	•	•	•	•

Depending on the operating system, runtimes are uploaded from

- AppStore
- Google Play for Android
- www.cuesystem.com for Windows device

and then installed on a device.

After that the customer purchases the registration and the user application can be uploaded from CVC.

Resources

Apple iOS

iCUE-standard

	Cut sheet	http://www.cuesystem.com/Files/ProductCutSheets/iCUE-standard.pdf
	User manual	http://www.cuesystem.com/Files/UserManuals/UM046_02_Mobile_Applications.pdf
	Application	http://itunes.apple.com/cz/app/icue-standard/id509478288?mt=8

iCUE-professional

	Cut sheet	http://www.cuesystem.com/Files/ProductCutSheets/iCUE-professional.pdf
	User manual	http://www.cuesystem.com/Files/UserManuals/UM046_02_Mobile_Applications.pdf
	Application	http://itunes.apple.com/cz/app/icue-professional/id509468649?mt=8&ls=1

Android

aCUE-standard

	Cut sheet	http://www.cuesystem.com/Files/ProductCutSheets/aCUE-standard.pdf
	User manual	http://www.cuesystem.com/Files/UserManuals/UM046_02_Mobile_Applications.pdf
	Application	http://play.google.com/store/apps/details?id=com.mepatek.aCUEstd

aCUE-professional

	Cut sheet	http://www.cuesystem.com/Files/ProductCutSheets/aCUE-professional.pdf
	User manual	http://www.cuesystem.com/Files/UserManuals/UM046_02_Mobile_Applications.pdf
	Application	http://play.google.com/store/apps/details?id=com.mepatek.aCUEpro

Windows

pcCUE-standard

	Cut sheet	http://www.cuesystem.com/Files/ProductCutSheets/pcCUE-standard_CutSheet.pdf
	User manual	http://www.cuesystem.com/Files/UserManuals/UM042_01_pcCUE.pdf
	Application	http://www.cuesystem.com/software_downloads.aspx

pcCUE-professional

	Cut sheet	http://www.cuesystem.com/Files/ProductCutSheets/pcCUE-professional_CutSheet.pdf
	User manual	http://www.cuesystem.com/Files/UserManuals/UM042_01_pcCUE.pdf
	Application	http://www.cuesystem.com/software_downloads.aspx

Wired Touch Panels

Overview

CUE offers a complete Ethernet IP-enabled touch panel product line which provides the ultimate one-touch solution for meeting rooms, conference rooms, boardrooms and high-tech homes. Touch panels combine functionality including multimedia integration, lighting automation, security monitoring, entertainment integration and meeting & presentation control.

Basic Classification

At the basic level, touch panels are classified by

- Installation method – tabletop, built-in, on-wall
- Display size – 4.3", 7", 12.1"

Common Features

All touch panels have the following common features:

- Active matrix color touch screen displays with LED backlit offer 32-bit colors (True Color) and transparency 8-bit alpha blending. Display resolution depends on the display size and is specified in the following document sections. Viewing angle is ±80° horizontal and ±80° vertical.
- Projected capacitive touch sensor offering many benefits including superior optics, gesture sensing and extreme durability.
- The touch panel GUI can use fully customized pages, buttons, bar graphs, sliders, drag-and-drop objects, clocks, weather info, video windows and many others graphic objects.
- All touch panels have memory RAM min. 256 MB and microSD Card min. 4 GB.
- The touch panel wakes its display automatically without any physical contact if proximity/motion sensor detects the presence of nearby.
- Auto-brightness functionality intelligently adjusts the brightness of the display based on ambient light to make reading comfortable.
- All touch panels are equipped with an internal microphone and speakers.
- The streaming video ability makes it possible to view security cameras and other video sources over the network. Touch panels support MJPEG and H.264 formats.
- Audio files stored in the touch panel or streaming audio can be used as button feedback, voice prompts, etc. Voice from the built-in microphone can be stored and played.
- Real time clock (RTC) allows to program scheduled applications.
- The single-cable Ethernet connection provides easy network integration. The Power over Ethernet technology enables a network cable to deliver both data and power. All touch panels are compatible with PoE IEEE 802.3af except 12" models. These models need PoE+ compatible with IEEE 802.3at.
- XPL^2 runtime inside allows to run applications programmed in Cue Visual Composer.
- All touch panels can serve as a controller and graphic user interface in one box. In Cue Visual Composer, touch panels and controllers are programmed in the same way, which makes it possible to use touch panels as full-fledged controllers with Ethernet control port and provide bi-directional control of any IP-enabled products through the Ethernet.
- The internal Admin web server is used for setup through a standard web browser.

Resources

http://www.cuesystem.com/wired_touch_panels.aspx

Tabletop Models

Edge-to-Edge Models

These wired tabletop touch panels offer clean modern design with edge-to-edge front glass and sleek aluminium body with integrated tabletop stand.

Models

	touchCUE-5	touchCUE-7	touchCUE-12
Product code	CS0371	CS451	CS0466
Display type	Color IPS LCD with LED backlit	Color a-Si TFT LCD with LED backlit	Color a-Si TFT LCD with LED backlit
Display size	4.3" (109 mm) diagonal	7" (177.8 mm) diagonal	12.1" (307.3 mm) diagonal
Resolution	800 x 480 pixels	1280 x 800 pixels	1280 x 800 pixels
Power supply	PoE, IEEE 802.3af	PoE, IEEE 802.3af	PoE+, IEEE 802.3at
Dimensions	136 x 81 x 73 mm	199 x 115 x 97 mm	320 x 192 x 153 mm
Weight	0.4 kg	0.8 kg	2.4 kg

Installation

Slim and low profile design sits perfectly on a table without obstructing views. The supplied flat Ethernet cable provides connection through a sleek single cable and the network connector is hidden in a tabletop stand.

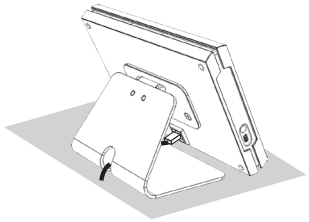
Tilting Stand Models

These wired tabletop touch panels feature aluminium body with a tilting tabletop stand. One programmable button provides an alternate method for quickly accessing the most common functions.

Models

	touchCUE-7	touchCUE-12
Product code	CS0375	CS0382
Display type	Color TFT LCD with LED backlit	Color a-Si TFT LCD with LED backlit
Display size	7" (177.8 mm) diagonal	12.1" (307.3 mm) diagonal
Resolution	800 x 480 pixels	1280 x 800 pixels
Buttons	1 programmable	1 programmable
Infra-red	IR receiver for capture and IR wireless control panel link IR transmitter	IR receiver for capture and IR wireless control panel link IR transmitter
Power supply	PoE, IEEE 802.3af	PoE+, IEEE 802.3at
Enclosure	Aluminium, tilting tabletop stand	Aluminium, tilting tabletop stand
Dimensions	198 x 150 x 122 mm	320 x 239 x 147 mm
Weight	1.4 kg	3.0 kg

Installation



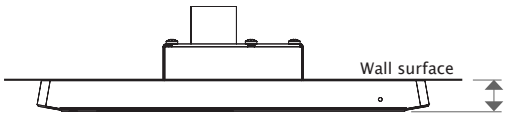
Tabletop models can be placed on any flat surface. Both 7" and 12" tabletop models are equipped with tilting tabletop stand. Don't forget to prepare proper bushing for the cable including standard connector. Connect the Ethernet cable and thread it through a hole in the tabletop stand. This will prevent possible damage to the connector from careless handling of the touch panel.

Built-In Models

Edge-to-Edge Models Compatible with Standard Electrical Box

The modern aluminium unibody enclosure highlighted by edge-to-edge glass installs easily over a 1-gang standard European/UK electrical box. It provides a wall-mounted solution that is compatible for all new touch panels allowing the touch panels to be changed at any time without having to cut the wall.

When installed, the touch panels protrude from the mounting surface as described in the following picture.

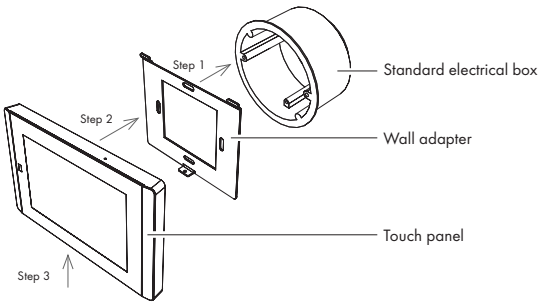


- touchCUE-5-B 11 mm
- touchCUE-7-B 13 mm
- touchCUE-12-B 21 mm

Models

	touchCUE-5-B	touchCUE-7-B	touchCUE-12-B
Product code	CS0372	CS0452	CS0467
Display type	Color IPS LCD with LED backlit	Color a-Si TFT LCD with LED backlit	Color a-Si TFT LCD with LED backlit
Display size	4.3" (109 mm) diagonal	7" (177.8 mm) diagonal	12.1" (307.3 mm) diagonal
Resolution	800 x 480 pixels	1280 x 480 pixels	1280 x 800 pixels
Power supply	PoE, IEEE 802.3af	PoE, IEEE 802.3af	PoE+, IEEE 802.3at
Dimensions	136 x 81 x 37 mm	199 x 120 x 39 mm	320 x 200 x 47 mm
Weight	0.3 kg	0.6 kg	2.0 kg

Installation



Installation is carried out in the following steps:

1. Install the wall adapter to the wall box using two screws.
2. Install the touch panel on the wall adapter.
3. Fix the touch panel to the wall adapter using a crew.

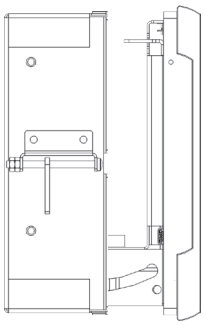
Models with the Back Box

These wired tabletop touch panels feature aluminium body. They install easily into the wall and other surfaces using the back box. One programmable button provides an alternate method of quickly accessing the most common functions.

Models

	touchCUE-7-B	touchCUE-12-B
Product code	CS0376	CS0383
Display type	Color TFT LCD with LED backlit	Color a-Si TFT LCD with LED backlit
Display size	7" (177.8 mm) diagonal	12.1" (307.3 mm) diagonal
Resolution	800 x 480 pixels	1280 x 800 pixels
Buttons	1 programmable	1 programmable
Infra-red	IR receiver for capture and IR wireless control panel link IR transmitter	IR receiver for capture and IR wireless control panel link IR transmitter
Power supply	PoE, IEEE 802.3af	PoE+, IEEE 802.3at
Dimensions	198 x 145 x 60 mm	320 x 225 x 61 mm
Weight	1.0 kg	2.3 kg

Installation



The back box (product code CS0409) provides a steel enclosure for the touchCUE-7-B and for touchCUE-12-B built-in touch panels. It is designed for pre-construction applications.

The back box is equipped with knockouts for cable installation.

On-Wall Models

These wired tabletop touch panels feature aluminium body and install easily over a 1-gang standard European/UK electrical box. The wall adapter is used and no back box is necessary. One programmable button provides an alternate method of quickly accessing the most common functions.

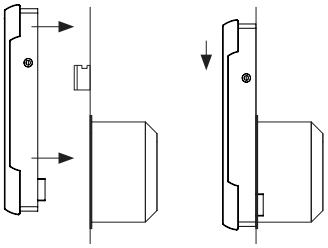
Models

	touchCUE-7-W	touchCUE-12-W
Product code	CS0447	CS0448
Display type	Color TFT LCD with LED backlit	Color TFT LCD with LED backlit
Display size	7" (177.8 mm) diagonal	12.1" (307.3 mm) diagonal
Resolution	800 x 480 pixels	1280 x 800 pixels
Buttons	1 programmable	1 programmable
Infra-red	IR receiver for capture and IR wireless control panel link IR transmitter	IR receiver for capture and IR wireless control panel link IR transmitter
Power supply	PoE, IEEE 802.3af	PoE+, IEEE 802.3at
Enclosure	Aluminium Compatible with European wall boxes	Aluminium Compatible with European wall boxes
Dimensions	198 x 145 x 24 mm	320 x 225 x 24 mm
Weight	0.6 kg	1.4 kg

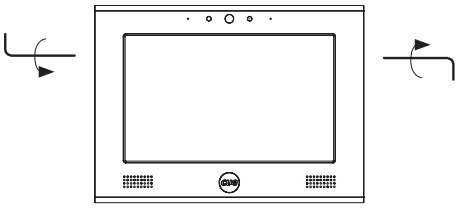
Installation

Installation is carried out in the following steps.

1. Install the wall-mounted adapter on the wall using screws.



2. Put the touch panel on the wall-mounted adapter.



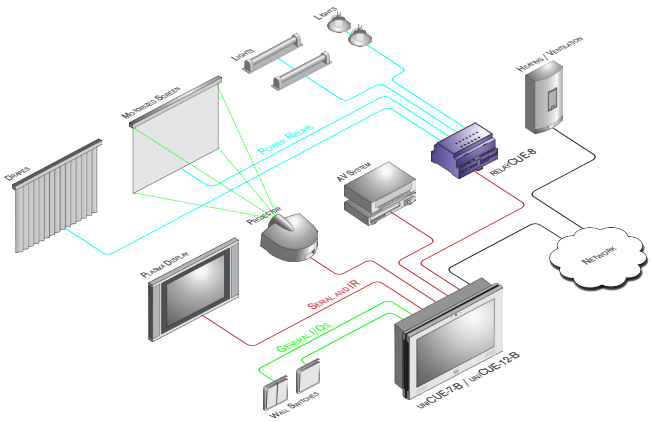
3. Carefully tighten two screws to fix the touch panel on the wall.

Touch Panel Controllers

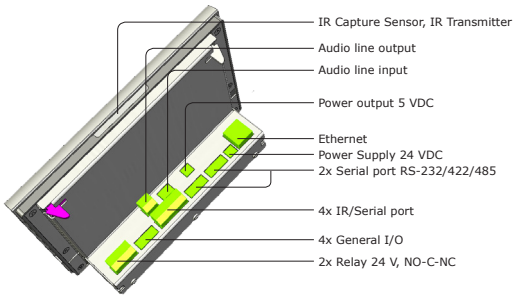
Overview

The uniCUE touch panel controllers represent the type of product combining the touch panel and the controller in one box. Everything in the room can be controlled with its integrated control ports. These devices offer a cost-effective, one-box solution for meeting and conference rooms, boardrooms, classrooms, private houses etc. From the design point of view, these products are fully compatible with cuenium² built-in touch panels. The front case is machined from a single billet made of aluminium greatly improving the rigidity of the device.

Application diagram



Rear panel description



Models

uniCUE-7-B

uniCUE-12-B

	uniCUE-7-B	uniCUE-12-B
Product code	CS0388	CS0404
Display size	7" (177.8 mm) diagonal	12.1" (307.3 mm) diagonal
Resolution	800 x 480 pixels	1280 x 800 pixels
Infra-red	IR receiver for capture and IR wireless control panel link IR transmitter	IR receiver for capture and IR wireless control panel link IR transmitter
Bi-directional serial RS-232/422/485	2	2
IR/Serial output	4	4
General I/O	4	4
Low-voltage relay 24 V	2	2
Power output	5 V / max. 1 A	5 V / max. 1 A
Power supply	24 VDC	24 VDC
Enclosure	Aluminium	Aluminium
Dimensions	198 x 145 x 60 mm	320 x 225 x 61 mm
Weight	1.1 kg	2.5 kg

Installation

Both uniCUE models are installed in the same way as built-in touch panels using the Back Box (CS0409).

Resources

http://www.cuesystem.com/touch_panel_controllers.aspx

Wireless Button Panels

IR Remoter

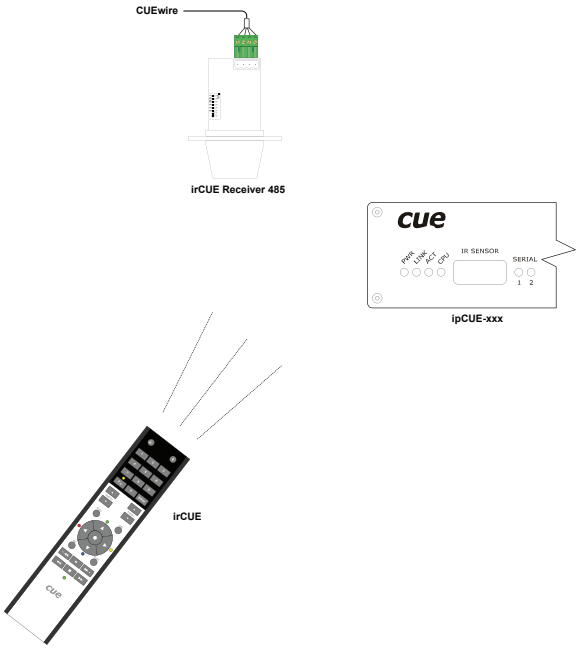
Introduction

The irCUE wireless handheld remote control panel is a compact infrared transmitter with a black plastic / wood and stainless steel enclosure.

It provides the total of 33 buttons. Buttons for the most frequent functions have fixed labels and the replaceable front panel plastic part offers space for custom-engraved labels for customized buttons.

The irCUE is delivered with a tabletop charging station for quick charging. If the irCUE is placed at the docking station, it remains functional and can be used as a tabletop panel.

Connection



The irCUE is connected to the rest of the control system via IR communication.

As the IR receiver you can use

- The irCUE Receiver 485 external unit
- IR receiver built into ipCUE and controlCUE controllers
- IR receiver built into keypadCUE-8-L and keypadCUE-8-E keypads.

Resources

http://www.cuesystem.com/wireless_button_panels.aspx

RF Button Panels

Introduction

Tx wireless buttons are a line of control panels with radio communication of 433.92 MHz. This line of panels includes wall-mounted and pocket transmitters. The transmitter is the part that provides the user with „free control". It may be positioned at any place. The transmitters fed from batteries may be situated even on an inflammable base or very close to bathtubs. The transmitters are powered by a lithium 3 V battery.

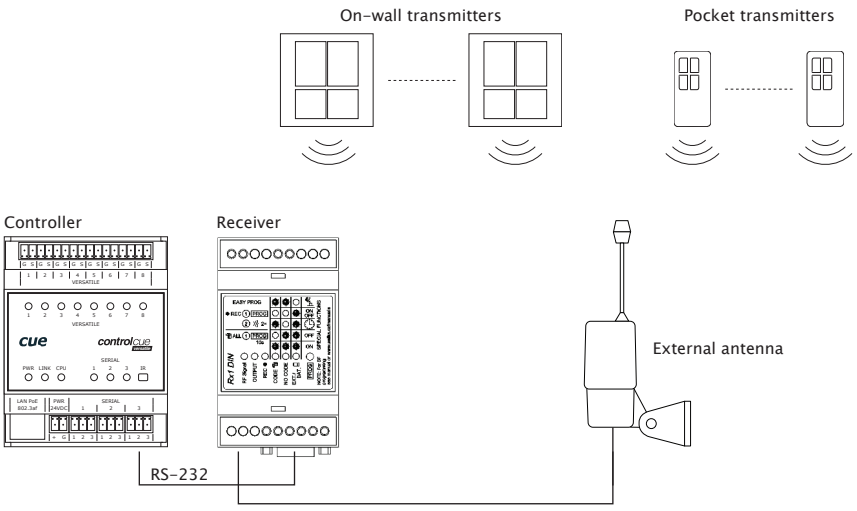
The Tx Time and Tx Element wall-mounted transmitters with 2 or 4 buttons are designed to match the range of ABB switches with modern square frames, and they can either be used by themselves or in various multiple frames combining their different colored designs. It is possible to mount the transmitter practically everywhere – on flammable surfaces, near a child's bed, a sink, on the glass, etc., yet there is no risk of injury being caused by electricity or risk of fire. The transmitter is mounted using screws or double-sided adhesive tape. All wall transmitters consist of a frame and a fingerboard. If you install more transmitters at one place, it is good to use multiple frames.

Pocket transmitters Tx Pocket 1, Tx Pocket 4, Tx Cross and Tx Key are designed for portable usage and enable the user to control up to two appliances, for example the central locking in a car and the garage door, or outdoor lights in the driveway and the electrical locking of the entrance door. The transmitters are designed to fit on a key ring and their oval-shaped cover slips easily into any pocket.

The DIN rail Rx1 DIN/LOG is a receiver designed for mounting into switchboards equipped with a DIN rail. It is a complete receiver equipped with inputs for antenna or for Rx Ext external receiver. The receiver can be connected to controllers using the bi-directional RS-232 communication port and the standard driver.

The Rx Ext external receiver is used if the place where the receiver is installed does not have sufficient receiving conditions. It is connected to the main receiver Rx1 DIN/LOG through a two-wire cable of maximum length 20 m. The case with the IP 33 cover enables also outdoor installation.

Connecting



Resources

http://www.cuesystem.com/wireless_button_panels.aspx

Wired Button Panels

Built-In Models

Overview

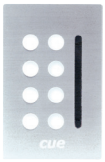
These programmable wall-mounted button control panels are designed to be built into the wall or any flat surface using a back box.

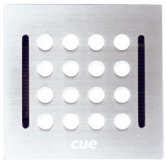
All buttons are supported with backlight, programmable indication and user changeable button labels that can be printed on a laser printer and inserted into the keypad. The full-function console keypads may be used as dedicated wired controllers for audio, video and environmental functions.

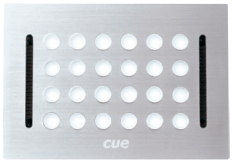
All models are equipped with one or two 20-LEDs bargraphs, which can be used for analog value indication (volume level, light level, etc.).

Keypads are delivered with a back box allowing installation into standard, plasteboard and wet wall.

Models



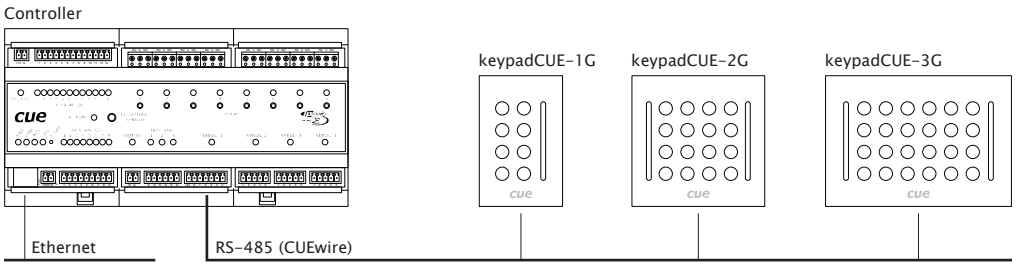




	keypadCUE-1G	keypadCUE-2G	keypadCUE-3G
Product code	CS0221	CS0222	CS0223
Buttons	8 with red backlit	16 with red backlit	24 with red backlit
Bar graph 20-LEDs	1	2	2
Indication	Programmable two level button backlit	Programmable two level button backlit	Programmable two level button backlit
Communication	RS-485	RS-485	RS-485
Power supply	24 VDC, 3 W	24 VDC, 4 W	24 VDC, 4 W
Enclosure	Stainless steel front panel	Stainless steel front panel	Stainless steel front panel
Dimensions	69 x 108 x 50 mm	110 x 108 x 50 mm	155 x 108 x 50 mm
Weight	0.2 kg	0.4 kg	0.7 kg
Included accessories	Metal back box	Metal back box	Metal back box

Connection

All models of the keypad are connected to the system by CUEwire. The 4-pin connector is located on the rear side of the keypad.



Resources

http://www.cuesystem.com/wired_button_panels.aspx

On-Wall Models

Overview

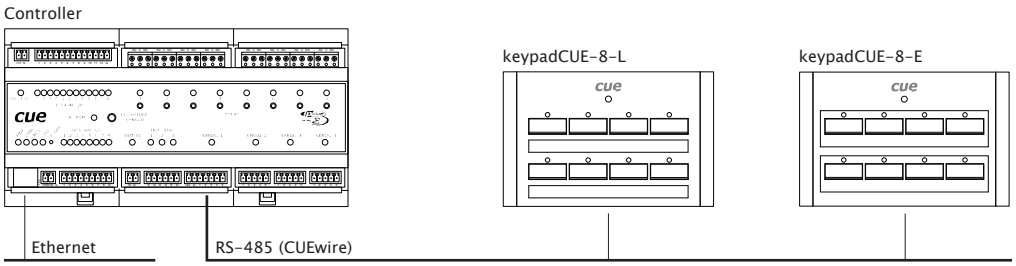
Featuring a stainless steel architectural finish, these keypads are wall-mounted control panels designed to be built onto standard European electrical wall boxes. Each keypad provides 8 buttons and programmable indication. Button labels can be engraved upon the plastic strips on the front panel. The keypadCUE-8-L makes it possible to use temporary printed or hand-written labels for the trial operation. The full function console keypad may be used as a dedicated wired control panel for audio, video and operating environment functions.

Thanks to the built-in IR receiver, it is possible to use the irCUE panel in the room where keypadCUE-8 is installed, without necessity to install a separate IR receiver.

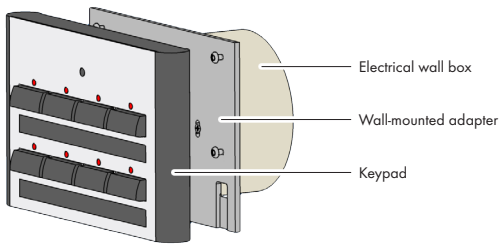
Models

	keypadCUE-8-L	keypadCUE-8-E
Product code	CS0287-004 (stainless steel) CS0287-014 (graphite grey)	CS0288-004 (stainless steel) CS0288-014 (graphite grey)
Buttons	8	8
Custom labels	Engraved or printed on a printer LED backlit	Engraved LED backlit
Indicators	8 programmable LEDs	8 programmable LEDs
Infra-red	IR receiver for IR wireless control panel link	IR receiver for IR wireless control panel link
Serial communication	RS-485	RS-485
Power supply	24 VDC	24 VDC
Enclosure	Metal / plastic	Metal / plastic
Dimensions	140 x 90 x 19 mm	140 x 90 x 19 mm
Weight	0.4 kg	0.4 kg
Included accessories	Wall-mounted adapter	Wall-mounted adapter

Connection



Mounting



These keypads can be mounted onto a standard European electrical wall box with spacing 60 mm between mounting screws.

Wall-mounted adapter is delivered with the keypad and it is mounted to the electrical wall box by two screws.

Resources

http://www.cuesystem.com/wired_button_panels.aspx

Tabletop Models

Overview

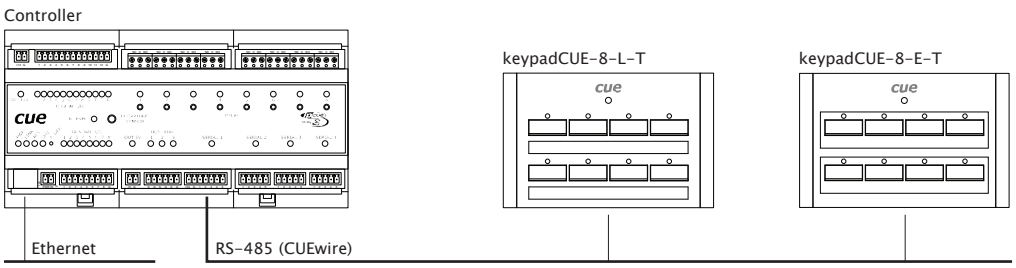
Featuring a stainless steel architectural finish, these keypads are tabletop control panels designed to be installed on a table. Each keypad provides 8 buttons and programmable indication. Button labels can be engraved upon the plastic strips on the front panel. The keypadCUE-8-L makes it possible to use temporary printed or hand-written labels for the trial operation. The full function console keypad may be used as a dedicated wired control panel for audio, video and operating environment functions.

Thanks to the built-in IR receiver, it is possible to use the irCUE panel in the room where keypadCUE-8 is installed, without the necessity to install a separate IR receiver.

Models

	keypadCUE-8-L-T	keypadCUE-8-E-T
Product code	CS0398-004 (stainless steel) CS0398-014 (graphite grey)	CS0399-004 (stainless steel) CS0399-014 (graphite grey)
Description	Tabletop model	Tabletop model Replaceable plastic strips for custom engraved labels
Buttons	8	8
Custom labels	Engraved or printed on a printer LED backlit	Engraved LED backlit
Indicators	8 programmable LEDs	8 programmable LEDs
Infra-red	IR receiver for IR wireless control panel link	IR receiver for IR wireless control panel link
Serial communication	RS-485	RS-485
Power supply	24 VDC	24 VDC
Enclosure	Metal / plastic	Metal / plastic
Dimensions	140 x 90 x 19 mm	140 x 90 x 19 mm
Weight	0.4 kg	0.4 kg

Connection



Resources

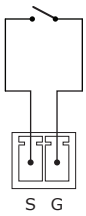
http://www.cuesystem.com/wired_button_panels.aspx

Buttons

Introduction

The Cue System makes it possible to connect buttons and switches from various manufactures according to the needs of the specific project and architect requests.

Connecting



Buttons and switches can be connected to the following ports:

- Versatile port
- General I/O
- Digital I/O
- Contact input

All these ports are equipped with an internal 5 VDC pull-up resistor. This facilitates contact connection without external power supply.

Resources

Drivers for buttons are installed with the Cue Visual Composer. Available drivers are described in the following table.

Button type	Control port		
	Contact input	Digital I/O	General I/O
Standard button	DIButton	DIOButton	GIOButton
Long press button	DILongPressButton	DIOLongPressButton	GIOLongPressButton
Repeat button	DIRepeatButton	DIORepeatButton	GIORepeatButton

For more details see CVC menu Help / Documentation / Generic Drivers.

Potentiometers

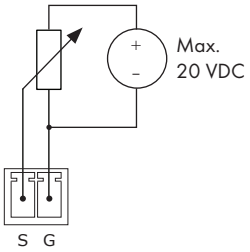
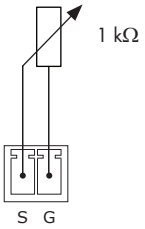
Introduction

Potentiometers are typically a 1 kΩ ohm linear taper control for single-point remote level adjustment for lights, temperature, volume, etc.

Connection

The potentiometer can be connected to the following ports:

- Versatile port
- General I/O

	External power supply	Using internal pull-up
		
Pull-up	Off	On
Output	Open	Open

For resistance values other than 1 kΩ, check the port parameters which will be used. Functionality depends primarily on port input resistance and A/D converter.

The following table lists the basic parameters of ports usable for potentiometers.

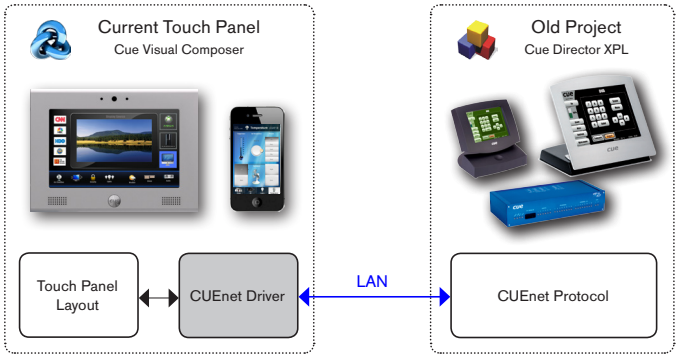
Unit	Versatile port	General I/O
ipCUEs	-	ADC 10 bits
controlCUE-one	-	ADC 10 bits
controlCUE-two	-	ADC 10 bits
controlCUE-versatile	ADC 12 bits	-
smartCUEs	-	ADC 12 bits

New Touch Panels in Old Systems

Overview

Converter Cue Director XPL CUEnet is a driver which makes it possible to use new CUE touch panels and runtimes, which only support Cue Visual Composer (CVC), in older projects. In these projects, controllers were programmed in Cue Director XPL and the touch panels layouts was created in Design Director. Cue Director XPL CUEnet driver emulates CUEnet communication used in Cue Director XPL projects.

When connected to the UDP server connector of some CUEunit, this driver allows the CUEunit to act as LAN connected touch panel in CUE system programmed in older “Cue Director XPL“(version 7.xx or later). Note that the panel which is to be replaced in the Cue Director XPL project must be included and programmed in this Cue Director XPL project!



This driver enables customers to use new CUE touch panels, Android or iOS devices in older installations, where you need to replace the old touch panel and/or add the new one, or where the customer wants to use a tablet or a smartphone as another control device. It is possible to keep the old Cue Director XPL program in controllers and it is not necessary to reprogram the controller in Cue Visual Composer. The new touch panel layout is created in CVC.

In case you need to replace an old panel connected by CUEwire, it is necessary to change the connection type of this panel to CUEnet in the Cue Director XPL project, because new panels support only Ethernet communication.

Resources

The Converter_Cue_Director_XPL_CUEnet ready-to-use driver is available in Cue Store. Access to Cue Store is under login.

Go to Cue Store and select

1. Categories – Device Drivers
2. Category – UDP Server
3. Subcategory – Converter

Then download Converter_Cue_Director_XPL_CUEnet.

Controllers and Interfaces

Controllers

controlCUE

Common Features

- Ethernet IP-enabled high-end controllers
- ARM® processor platform
- Various types of control ports, infra-red outputs up to 1.2 MHz
- Bi-directional control of any IP-enabled products through the Ethernet port
- Front panel LED indicators for all control ports
- Real time clock (RTC) for scheduling applications
- Web server and Admin Web for setup through a standard web browser

Tabletop and Rack Mount Models

controlCUE-one

controlCUE-two

Product code	CS0412	CS0414
RAM / microSD Card	256 MB / min. 4 GB	256 MB / min. 4 GB
IR receiver for capture and IR wireless control panel link	1	1
Wired 10/100 BaseT Ethernet	1	1
Bi-directional serial RS-232/422/485	2	6
IR/Serial output	4	8
General I/O (analog in / digital out)	4	8
Low-voltage relay 24 V / 0.5 A	2	4
Audio	Line in, line out	Line in, line out
Power supply	24 VDC	24 VDC
Enclosure	Aluminium	Aluminium
Dimensions	210 x 43.5 x 92 mm	210 x 43.5 x 92 mm
Weight	0.5 kg	0.6 kg
Included accessories	4x IR Adapter, Connector set, Ethernet cable, Power supply	4x IR Adapter, Connector set, Ethernet cable, Power supply

DIN Rail Models

	controlCUE-versatile-d	controlCUE-dali-d	controlCUE-knx-d	controlCUE-dmx-d	controlCUE-poseidon-d
Product code	CS0453	CS0454	CS0455	CS0456	CS0457
RAM / Non-volatile flash	64 MB / 256 MB	64 MB / 256 MB	64 MB / 256 MB	64 MB / 256 MB	64 MB / 256 MB
IR receiver for capture	1	1	1	1	1
Wired 10/100 BaseT Ethernet	1	1	1	1	1
Bi-directional serial RS-232/485	3	1	1	1	1
Versatile port	8	4	4	4	4
DALI	–	1	–	–	–
KNX	–	–	1	–	–
DMX512	–	–	–	1x in, 1x out	
Poseidon RF	–	–	–	–	1
Power supply	PoE, IEEE 802.3af 24 VDC	PoE, IEEE 802.3af 24 VDC	PoE, IEEE 802.3af 24 VDC	PoE, IEEE 802.3af 24 VDC	PoE, IEEE 802.3af 24 VDC
Enclosure	Plastic, DIN rail, 4 M	Plastic, DIN rail, 4 M	Plastic, DIN rail, 4 M	Plastic, DIN rail, 4 M	Plastic, DIN rail, 4 M
Dimensions	70 x 90 x 58 mm	70 x 90 x 58 mm	70 x 90 x 58 mm	70 x 90 x 58 mm	70 x 90 x 58 mm
Weight	0.2 kg	0.2 kg	0.2 kg	0.2 kg	0.2 kg
Included accessories	2x IR Adapter Connector set Ethernet cable Power supply	Connector set Ethernet cable Power supply	Connector set Ethernet cable Power supply	Connector set Ethernet cable Power supply	Antenna incl. cable Connector set Ethernet cable Power supply

Resources

http://www.cuesystem.com/ipcue_controllers.aspx

ipCUE

Common Features

- Ethernet IP-enabled controllers
- Various types of control ports, infra-red outputs up to 1.2 MHz
- Bi-directional control of any IP-enabled products through the Ethernet port
- Front panel LED indicators for all control ports
- Real time clock (RTC) for scheduling applications
- Web server and Admin Web for setup through a standard web browser

Tabletop and Rack Mount Models

	ipCUE-alpha	ipCUE-beta	ipCUE-epsilon	ipCUE-delta
Product code	CS0251	CS0252	CS0268	CS0267
RAM / Non-volatile flash memory	16 MB / 16 MB	16 MB / 16 MB	16 MB / 16 MB	16 MB / 16 MB
IR receiver for capture and IR wireless control panel link	1	1	1	1
Wired 10/100 BaseT Ethernet	1	1	1	1
Bi-directional serial RS-232	2	2	2	2
Bi-directional serial RS-485	1	1	1	1
Bi-directional serial RS-232/422/485	4	–	–	4
IR/Serial output	8	8	8	8
Digital I/O (digital in / digital out)	–	–	–	–
General I/O (analog in / digital out)	8	–	8	8
Analog output 0 – 10 V	–	–	4	4
Low-voltage relay 24 V / 0.5 A	2	–	8	16
Power output	5 V / max. 1 A	5 V / max. 1 A	5 V / max. 1 A	5 V / max. 1 A
Power supply	24 VDC	24 VDC	24 VDC	24 VDC
Enclosure	Aluminium	Aluminium	Aluminium	Aluminium
Dimensions	210 x 43.5 x 92 mm	210 x 43.5 x 92 mm	210 x 43.5 x 92 mm	421 x 43.5 x 92 mm
Weight	0.6 kg	0.5 kg	0.6 kg	0.9 kg
Included accessories	4x IR Adapter, Connector set, Ethernet cable, Power supply	4x IR Adapter, Connector set, Ethernet cable, Power supply	4x IR Adapter, Connector set, Ethernet cable, Power supply	4x IR Adapter, Connector set, Ethernet cable, Power supply

DIN Rail Models

	ipCUE-gamma	ipCUE-sigma
Product code	CS0253	CS0333
RAM / Non-volatile flash memory	16 MB / 16 MB	16 MB / 16 MB
IR receiver for capture	–	1
Wired 10/100 BaseT Ethernet	1	1
Bi-directional serial	1x RS-485, 2x RS-232	4x RS-232/422/485
IR/Serial output	2	3
Digital I/O (digital in / digital out)	–	12
General I/O (analog in / digital out)	8	8
Analog output 0 – 10 V	–	–
Low-voltage relay 24 V / 0.5 A	2	–
Potential free relay	–	8x NC-C-NO Resistive load: max. 250 VAC / 16 A Capacitive load: max. 250 VAC / 16 A Max. inrush current: 30 A Inductive load: max. 250 VAC / 4 A
Power output	–	5 VDC / max. 1 A, 12 VDC / max. 400 mA
Power supply	24 VDC	24 VDC
Enclosure	Plastic, DIN rail, 6 M	Plastic, DIN rail, 12 M
Dimensions	106 x 90 x 58 mm	210 x 90 x 58 mm
Weight	0.4 kg	1.0 kg
Included accessories	2x IR Adapter, Connector set, Ethernet cable, Power supply	3x IR Adapter, Connector set, Ethernet cable, Power supply

Resources

http://www.cuesystem.com/ipcue_controllers.aspx

IP Interfaces

Common Features

- Ultra-compact interfaces for cost-effective control port expanding
- Wired or wireless network communication
- Fully compatible with touch panels, controllers and mobile solution runtimes
- Front panel indicators for power, network and all control ports
- Programming in Cue Visual Composer
- Web server and Admin Web for setup through a standard web browser
- Unified aluminium enclosure for desktop, 19" rack, DIN rail and wall installation
- For available accessories see the section Accessories

Wired Models

	smartCUE-zero	smartCUE-one	smartCUE-two	smartCUE-three
Product code	CS0421	CS0440	CS0442	CS0444
Wired 10/100 BaseT Ethernet	1	1	1	1
Bi-directional serial RS-232	1	1	1	1
Bi-directional serial RS-232/422/485	1	-	-	-
IR/Serial output	-	-	-	4
Digital I/O (digital in / digital out)	4	8	8	8
General I/O (analog in / digital out)	-	-	-	4
Low-voltage relay	-	-	6	-
Power supply	PoE, IEEE 802.3af	PoE, IEEE 802.3af	PoE, IEEE 802.3af	PoE, IEEE 802.3af
Enclosure	Aluminium	Aluminium	Aluminium	Aluminium
Dimensions	105 x 43.5 x 92 mm	105 x 43.5 x 92 mm	105 x 43.5 x 92 mm	105 x 43.5 x 92 mm
Weight	0.3 kg	0.3 kg	0.3 kg	0.3 kg
Included accessories	Connector set Ethernet cable	Connector set Ethernet cable	Connector set Ethernet cable	Connector set Ethernet cable 2x IR Adapter /i

Wireless Models

	smartCUE-zero-wifi	smartCUE-one-wifi	smartCUE-two-wifi	smartCUE-three-wifi
Product code	CS0423	CS0441	CS0443	CS0445
Wireless network, IEEE 802.11b/g Wi-Fi 2.4 GHz	1	1	1	1
Bi-directional serial RS-232	1	1	1	1
Bi-directional serial RS-232/422/485	1	–	–	–
IR/Serial output	–	–	–	4
Digital I/O (digital in / digital out)	4	8	8	8
General I/O (analog in / digital out)	–	–	–	4
Low-voltage relay	–	–	6	–
Power supply	12 to 24 VDC	12 to 24 VDC	12 to 24 VDC	12 to 24 VDC
Enclosure	Aluminium	Aluminium	Aluminium	Aluminium
Dimensions	105 x 43.5 x 92 mm	105 x 43.5 x 92 mm	105 x 43.5 x 92 mm	105 x 43.5 x 92 mm
Weight	0.3 kg	0.3 kg	0.3 kg	0.3 kg
Included accessories	Connector set Ethernet cable Power supply	Connector set Ethernet cable Power supply	Connector set Ethernet cable Power supply	Connector set Ethernet cable Power supply 2x IR Adapter /i

Resources

http://www.cuesystem.com/ethernet_interfaces.aspx

Interfaces

Temperature and Digital Inputs

	sensorCUE	sensorCUE-W	inputCUE	inputCUE-W
Product code	CS0265	CS0289-101	CS0191	CS0334
Description	Temperature and daylight sensor for outdoor use	Temperature and daylight sensor for indoor use	Contact input unit LED indicator Address settings by DIP switch	Contact and temperature sensor input unit Delivered with IO cables and connectors
Inputs	Temperature measurement -55 ÷ +125°C Daylight sensor may be calibrated for day / night light level recognition	Temperature measurement -20 ÷ +50°C Daylight sensor may be calibrated for day / night light level recognition	8x potential free contact	8x potential free contact 1x sensor Pt1000
Outputs	-	-	-	8x Digital output TTL suitable for LED
Communication	RS-485 (CUEwire)	RS-485 (CUEwire)	RS-485 (CUEwire)	RS-485 (CUEwire)
Buttons	-	-	-	-
Power supply	24 VDC	24 VDC	24 VDC	24 VDC
Enclosure	Metal, protection IP43	Plastic, European electrical wall box compatible	Plastic, DIN rail compatible	European electrical wall box compatible
Dimensions	80 x 30 x 15 mm	83 x 81 x 16 mm	53 x 90 x 58 mm	50 x 21 mm
Weight	0.2 kg	0.1 kg	0.3 kg	0.1 kg

Control Bus Interfaces

	KNXgw232	sbiCUE-DMX
Product code	CS0439	CS0201
Description	KNX/EIB bus interface Control through RS-232	DMX512 interface with separate input and output Full channel range reception, transmission and merge
Inputs	KNX/EIB bus	DMX512 input, full range of 512 channels
Outputs	KNX/EIB bus	DMX512 output, full range of 512 channels
Communication	RS-232	RS-232
Buttons	–	–
Indicators	KNX/EIB send / receive RS-232 send / receive	Power, DMX512 activity
Power supply	From KNX bus / 10 mA	24 VDC
Enclosure	Plastic, DIN rail compatible	Plastic, DIN rail compatible
Dimensions	17 x 90 x 58 mm	53 x 90 x 58 mm
Weight	0.1 kg	0.3 kg

Lighting Control

	PEF150	PEF200	PEA208
Product code	CS0249-1 (version 110 V) CS0249-2 (version 230 V)	CS0166-1 (version 110 V) CS0166-2 (version 230 V)	CS0225-1 (version 110 V) CS0225-2 (version 230 V)
Description	Interface for fluorescent lamp DALI dimming ballasts	Two-channel interface for fluorescent lamp DSI dimming ballasts	Analog output 0 – 10 V Built-in relays LED indicators
Potential free contact input	4x Local control input	4x Local control input	4x Local control input
Outputs	1x DALI up to 64 dimming ballasts, controls up to 15 independent groups	2x DSI ports, each up to 50 electronic ballasts	2x Analog output 0 – 10 V 2x Relay 230 V, max. 8 A
Communication	RS-485 (PEbus)	RS-485 (PEbus)	RS-485 (PEbus)
Buttons	4x test button	4x test button	4x test button
Indicators	Power, serial channel, status of two groups	Power, serial channel, status of outputs	110 or 230 VAC
Power supply	110 or 230 VAC	110 or 230 VAC	Plastic, DIN rail compatible
Enclosure	Plastic, DIN rail compatible	Plastic, DIN rail compatible	71 x 90 x 58 mm
Dimensions	71 x 90 x 58 mm	71 x 90 x 58 mm	0.3 kg
Weight	0.3 kg	0.3 kg	

Resources

http://www.cuesystem.com/interfaces.aspx

Power Switching Units

Models

	relayCUE-8	powerAUX
Product code	CS0335-1 (version 110 V) CS0335-2 (version 230 V)	CS0016
Description	Eight-relay switching unit Control through RS-485 or potential free contact inputs	Eight-relay switching unit Control through potential free contact inputs
Potential free relay	4x C-NO, 4x NC-C-NO Resistive load: max. 250 VAC / 10 A Capacitive load: max. 250 VAC / 10 A Max. inrush current: 80 A / 20 ms Inductive load: max. 250 VAC / 2 A	4x C-NO, 4x NC-C-NO Resistive load: max. 250 VAC / 16 A Capacitive load: max. 250 VAC / 16 A Max. inrush current: 30 A Inductive load: max. 250 VAC / 4 A
Serial communication	RS-485 (PEbus)	-
Potential free contact input	8x Local control input	8
Test buttons	8	-
Indicators	Power Serial channel activity Status of all relays	Power Status of all relays
Power supply	230 or 110 VAC	230 or 110 VAC
Enclosure	Plastic, DIN rail compatible	Plastic, DIN rail compatible
Dimensions	158 x 90 x 58 mm	158 x 90 x 58 mm
Weight	0.5 kg	0.5 kg

	PER610	PES03
Product code	CS0167-1 (version 110 V) CS0167-2 (version 230 V)	CS0168
Description	Six-relay switching unit Control through RS-485 or potential free contact inputs	Three-channel suppressor unit for switching channels Voltage: max. 275 VAC Load current: max. 10 A
Potential free relay	6x NC-C-NO Resistive load: max. 250 VAC / 10 A Capacitive load: max. 250 VAC / 10 A Max. inrush current: 80 A / 20 ms Inductive load: max. 250 VAC / 2 A	-
Serial communication	RS-485 (PEbus)	-
Potential free contact input	6x Local control input	-
Test buttons	6	-
Indicators	Power Serial channel activity Status of all relays	-
Power supply	230 or 110 VAC	230 or 110 VAC
Enclosure	Plastic, DIN rail compatible	Plastic, DIN rail compatible
Dimensions	106 x 90 x 58 mm	36 x 90 x 58 mm
Weight	0.5 kg	0.1 kg

Resources

http://www.cuesystem.com/switching_units.aspx

Dimmers

Resistive and Inductive Loads

	PED108	PED202
Product code	CS0164-1 (version 110 V) CS0164-2 (version 230 V)	CS0165-1 (version 110 V) CS0165-2 (version 230 V)
Description	One-channel dimmer Control through RS-485 or potential free contact inputs	Two-channel dimmer Control through RS-485 or potential free contact inputs
Outputs	1	2
Output load type	Resistive and inductive	Resistive and inductive
Max. output load per channel	8 A	2.7 A (max. 4 A total)
Over-current protection	Fuse	Fuse
Serial communication	RS-485 (PEbus)	RS-485 (PEbus)
Potential free contact input	2x Local control input	4x Local control input
Test buttons	2	4
Indicators	Power, Serial channel activity, Status of output	Power, Serial channel activity, Status of outputs
Power supply	230 or 110 VAC	230 or 110 VAC
Enclosure	Plastic, DIN rail compatible	Plastic, DIN rail compatible
Dimensions	106 x 90 x 58 mm	106 x 90 x 58 mm
Weight	0.8 kg	0.5 kg

Resistive and Capacitive Loads

	PET102	PET105
Product code	CS0244-1 (version 110 V) CS0244-2 (version 230 V)	CS0245-1 (version 110 V) CS0245-2 (version 230 V)
Description	One-channel dimmer Control through RS-485 or potential free contact inputs Suitable for electronic transformers	One-channel dimmer Control through RS-485 or potential free contact inputs Suitable for electronic transformers
Outputs	1	1
Output load type	Resistive and capacitive	Resistive and capacitive
Max. output load per channel	2 A	5 A
Over-current protection	Electronic	Electronic
Serial communication	RS-485 (PEbus)	RS-485 (PEbus)
Potential free contact input	2x Local control input	2x Local control input
Test buttons	2	2
Indicators	Power, Serial channel activity, Status of output	Power, Serial channel activity, Status of output
Power supply	230 or 110 VAC	230 or 110 VAC
Enclosure	Plastic, DIN rail compatible	Plastic, DIN rail compatible
Dimensions	53 x 90 x 58 mm	53 x 90 x 58 mm
Weight	0.5 kg	0.5 kg

Resources

http://www.cuesystem.com/dimmers.aspx

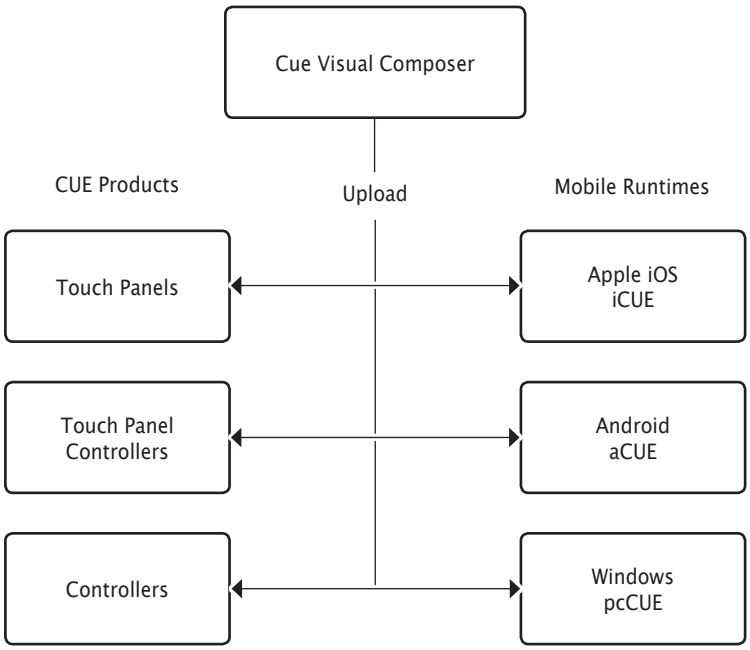
Programming

Introduction

How the Programming Works

CUE offers many software products which make it possible to create a complete control solution using Cue hardware and/or third-party hardware.

The following picture describes how CUE software works. An application created in Cue Visual Composer is uploaded to hardware equipped with runtime. Upload is realized using wired / wireless network.



Programming Tools

Programming tools are Windows-based programs which make it possible to create and upload applications to hardware equipped with runtime. Currently CUE offers the following development tools:

- Cue Visual Composer (CVC) is All-In-One software for Cue System programming.
- CVC Application Loader is used for uploading applications prepared in CVC.

Firmware

Firmware (CUE product runtimes) are runtimes in CUE hardware (CUEunits) which run projects prepared in CVC. The following units can run application created in CVC

- Touch Panels.
- Touch Panel Controllers
- Controllers

Mobile Device Runtimes

Mobile runtimes are applications developed for specific operating systems which run projects prepared in CVC. The following runtimes can run applications created in CVC.

- iCUE is a runtime for Apple iOS
- aCUE is a runtime for Android operating system
- pcCUE is a runtime for Windows based devices

To learn more about mobile device runtimes, see the chapter User Interfaces / Mobile Devices.

Cue Visual Composer (CVC)

Overview

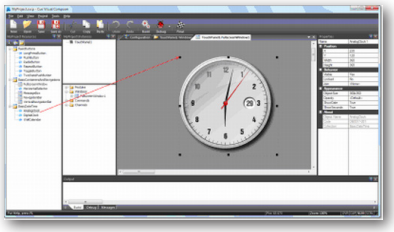
Cue Visual Composer (CVC) is a new generation All-In-One Windows-based software for control application programming. CVC is innovative mainly due to its unique concept. Touch panels and controllers are programmed in the same way, which makes it possible to use touch panels as full-fledged control units.

Cue Visual Composer integrates the following features:

- System Configuration allows to make visual 2D configuration with cross-page interconnection.
- Touch Panel Design serves for touch panel Graphic User Interface (GUI) creation.
- Application programming using XPL^2 language
- IR codes capture and edit support
- Serial and IP drivers programming
- Graphic objects programming

Description

Graphic Objects



Graphic objects are programmed at the level of standard XPL^2 language which includes graphical API (Application Programming Interface). When designing the touch panel graphic layout, application programmers therefore do not depend on a fixed set of objects delivered by the software manufacturer but are free to create their own, often very sophisticated objects or whole functional blocks. Runtime's Resize-On-Demand technology for graphic resources dramatically simplifies creating of graphical objects. It is not necessary to prepare special graphics for different objects sizes.

Cue Symbol Font includes more than one hundred and thirty symbols covering the needs of most control applications. The symbol set is grouped into Transport, Arrows & Movements, AV / TV Control, Indicators etc. Runtime's High Color Enhancer improves the subjective perception of color depth. On touch panels with 16-bit color depth the application graphics look as if it had 24-bit color depth.

XPL^2 Language

One universal programming language XPL^2 makes it possible to program graphical objects, touch panel layouts, device drivers and other parts of control application. Effective programming is achieved by the visual programming approach with drag-and-drop, advanced editing technique the IntelliSense, export and import of ready-to-use pieces of program and more.

Cue Visual Composer thus becomes an open platform for a large group of application programmers and makes an important contribution to the development of modern graphical user interfaces. The XPL^2 programming language itself is tailored to the needs of control systems used to integrate various technologies. It includes a complete set of powerful commands that enable system integrators to achieve an effective, robust and easily maintainable code.

Application language localization and Unicode character support are inherent parts of CVC, so it does not require any programming effort. Any part of source code can be protected by a password to protect the author's intellectual property and can also be licensed to specific hardware.

Simulation and Debugging

CVC and all runtimes for Microsoft Windows-based computers can utilize multi-core processors. CVC offers many various ways of debugging and testing applications, which significantly shortens the development cycle. The whole project can be simulated anytime on a computer or tested on real hardware units using their control ports. For each unit in the project this debug mode can be set individually and both simulation and real unit testing can be combined. CVC displays debug messages from simulated as well as real units.

Firmware Update On-The-Fly

Firmware update On-The-Fly is implemented for all CUE touch panels and controllers. All firmware is part of CVC installation. If CVC recognizes an older firmware version, it automatically updates it before debugging or final project uploading.

Pre-Programmed Building Blocks

Pre-programmed building blocks dramatically increase productivity in the preparation of control applications using Cue Visual Composer. Currently we offer the following types: Graphic Collections, Device Drivers, Applets and Widgets.

- Graphic Collection is a set of ready-to-use graphic objects used to prepare touch panel graphical interface.
- Device Driver is a part of XPL[2] code which communicates with the controlled device.
- Applet is a part of program that performs specific task and it runs within the context of a larger program, such as Sunrise/Sunset Timer or Simple Scheduler.
- Widget is a small full functional application that can be inserted into a Cue Visual Composer project.

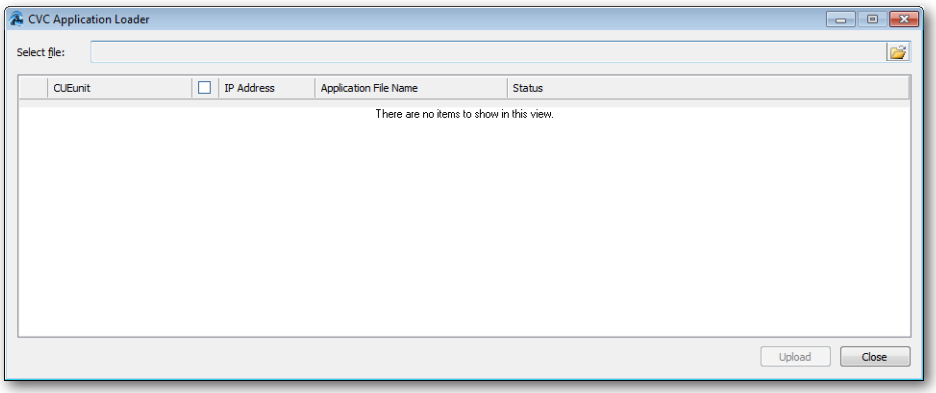
Resources

http://www.cuesystem.com/cvc_setup.aspx

CVC Application Loader

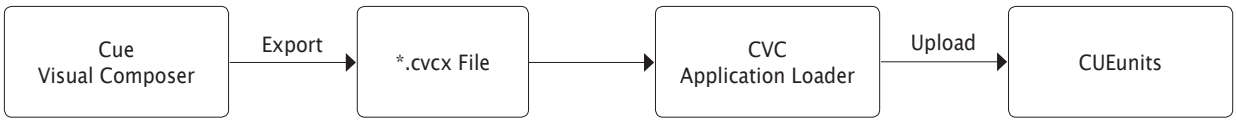
Introduction

The CVC Application Loader is a stand-alone Windows application which provides project upload without using Cue Visual Composer. The uploaded project must be stored in a *.cvcx file. This enables you to upload later on the units that were not online at the time of the final upload. This can be for example a smartphone with mobile runtime.



Usage

The following picture describes how to use the CVC Application Loader.



The steps are

1. Export the finished CVC application (menu Final / Export As) to the *.cvcx file.
2. Start CVC Application Loader
3. Open *.cvcx in the CVC Application Loader.
4. Upload the complete project at one time. Double check if all units you want to upload are checked and press the Upload button.

Note

The Cue System is a distributed system where it is necessary to ensure the consistency of applications in all used CUE units. This is done by a unique ID embedded into the applications. Any time you press the final button, this ID is changed. That's why it is necessary to generate all CUE unit applications during one final session.

Resources

http://www.cuesystem.com/cvc_setup.aspx

Power Switching

Introduction

Switching Applications

This chapter describes high-voltage switching applications. A switcher (relay, contactor) duty is characterized by the utilization category plus the indication of the rated operating voltage and the rated operating current, or the motor characteristics. In fact some switching applications and the specific criteria characterizing the types of load controlled can modify the recommended utilization characteristics.

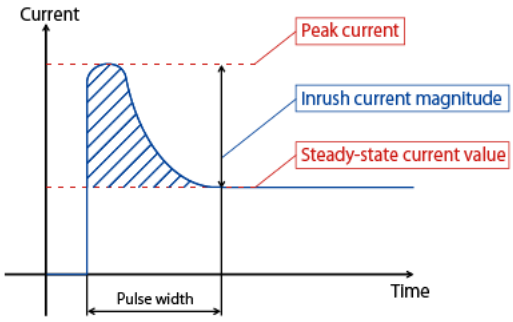
The major applications are as follows.

Capacitor Banks Switching

This application is characterized by high current peaks when switching-on the contactor and the presence of harmonic currents on uninterrupted duty.

For this application, IEC 947-4-1 has defined the utilization category AC-6b. Practical ratings have to be defined according to tests or, in absence of tests, by a calculation indicated in IEC 947-4-1.

Capacitive loads have high inrush currents which can cause damage to the contacts of the switch. Inrush current refers to the input current of short duration that flows into the driver during the initial start-up to charge the capacitors on the input side.



Typically, this is a short duration current, whose amplitude is much greater than the operating or steady-state current. Inrush current (cold start) is usually included in load type specifications.

Transformers Switching

This application is characterized by high current peaks on the contactor closing due to magnetization phenomena.

The corresponding utilization category according to IEC 947-4-1 is AC-6a. Ratings are derived from test values for AC-3 or AC-4 according to the formula given in IEC 947-4-1.

Lighting Circuits Switching

The current peaks the contactor closing, the power factor vary depending on the type of lamps, the switching method used and whether compensation systems are fitted or not.

IEC 947-4-1 contains two standard utilization categories:

- AC-5a for the switching of the electric discharge lamps.
- AC-5b for the switching of the incandescent lamps.

Utilization Categories

Utilization categories are defined by the IEC standards and indicate the type of electrical load and duty cycle of the loads to ease the selection of relays and contactors.

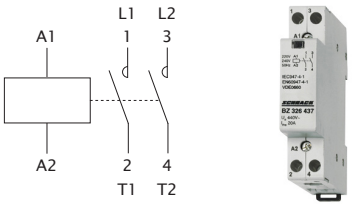
Voltage	Category	Type of Application	IEC Standard
A.C.	AC-1	Non-inductive or slightly inductive loads, resistance furnaces. Power factor 0.7 - 0.8 (slightly inductive).	947-4
	AC-2	Slip-ring motors: starting, switching-off.	
	AC-3	Squirrel-cage motors: starting, switching-off motors during running. Power factor 0.4 - 0.5 (AC-3).	
	AC-4	Squirrel-cage motors: starting, plugging, inching.	
	AC-5a	Switching of electric discharge lamp controls.	
	AC-5b	Switching of incandescent lamps.	
	AC-6a	Switching of transformers.	
	AC-6b	Switching of capacitor banks.	
	AC-7a	Slightly inductive loads in household appliances: examples: mixers, blenders.	
	AC-7b	Motor-loads for household appliances: examples: fans, central vacuum.	
	AC-8a	Hermetic refrigerant compressor motor control with manual resetting of overload releases.	
	AC-8b	Hermetic refrigerant compressor motor control with automatic resetting of overload releases.	
	AC-12	Control of resistive loads and solid state loads with isolation by opto couplers.	947-5
	AC-13	Control of solid state loads with transformer isolation.	
	AC-14	Control of small electromagnetic loads (≤ 72 VA).	
	AC-15	Control of electromagnetic loads (> 72 VA).	947-3
	AC-20	Connecting and disconnecting under no-load conditions.	
	AC-21	Switching of resistive loads, including moderate overloads.	
	AC-22	Switching of mixed resistive and inductive loads, including moderate overloads.	
	AC-23	Switching of motor loads or other highly inductive loads.	
A.C. and D.C.	A	Protection of circuits, with no rated short-time withstand current	947-2
	B	Protection of circuits, with a rated short-time withstand current	
D.C.	DC-1	Non-inductive or slightly inductive loads, resistance furnaces.	947-4
	DC-3	Shunt motors: starting, plugging, inching. Dynamic breaking of d.c. motors.	
	DC-5	Series motors: starting, plugging, inching. Dynamic breaking of d.c. motors.	
	DC-6	Switching of incandescent lamps.	
	DC-12	Control of resistive loads and solid state loads with isolation by opto couplers.	
	DC-13	Control of electromagnets.	947-5
	DC-14	Control of electromagnetic loads having economy resistors in circuit.	
	DC-20	Connecting and disconnecting under no-load conditions.	
	DC-21	Switching of resistive loads, including moderate overloads.	947-3
	DC-22	Switching of mixed resistive and inductive loads, including moderate overloads (i.e. shunt motors)	
	DC-23	Switching of highly inductive loads (i.e. series motors)	

Contactors

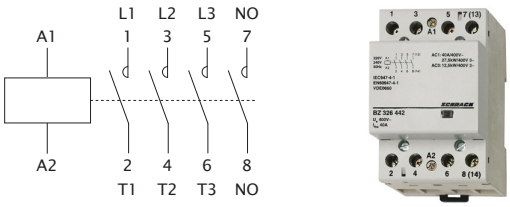
Overview

A contactor is an electrically controlled switch used for the switching of a power circuit, similar to a relay except with higher current ratings. A contactor is controlled by a circuit which has a much lower power level than the switched circuit. Contactors are used to control electric motors, lighting, heating, capacitor banks, thermal evaporators, and other electrical loads.

2-pole contactor



4-pole contactor



The power terminals on the contactors are single digits – odd for line side terminals and even for load side terminals.

Coil terminals are designated by a letter and a number. Terminals for a single winding coil are designated A1 and A2.

The operation of inductive circuits causes over-voltages, in particular on the opening of the contactor coil. The electromagnetic energy stored in the coil during contactor closing is restored on opening in the form of surges, the slope and amplitude of which may rise to several kilovolts. A number of the drawbacks are observed ranging from interference on the electronic devices to breakdown of insulators and even destruction of certain sensitive components.

To reduce the harmful effects of these over-voltages, it is recommended to use a surge suppressor connected to the coil.

Why to Use Contactors

The relay contacts are constructed for resistive load. If these relays are used for the switching of inductive or capacitive loads, voltage or power peaks can occur, which may exceed these parameters.

We therefore do not recommend using relays for switching inductive or capacitive loads with exceed relay specifications. If you need to switch higher inductive or capacitive loads, use contactors.

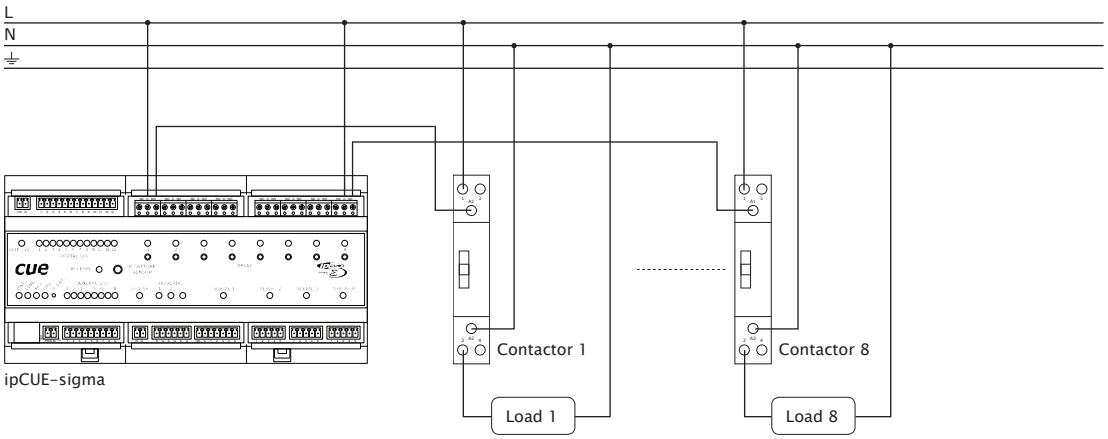
Unlike relays, contactors are designed with features to control and suppress the arc produced when interrupting inductive load currents. You can then use the relay of the unit to control the coil of this contactor.

Connection

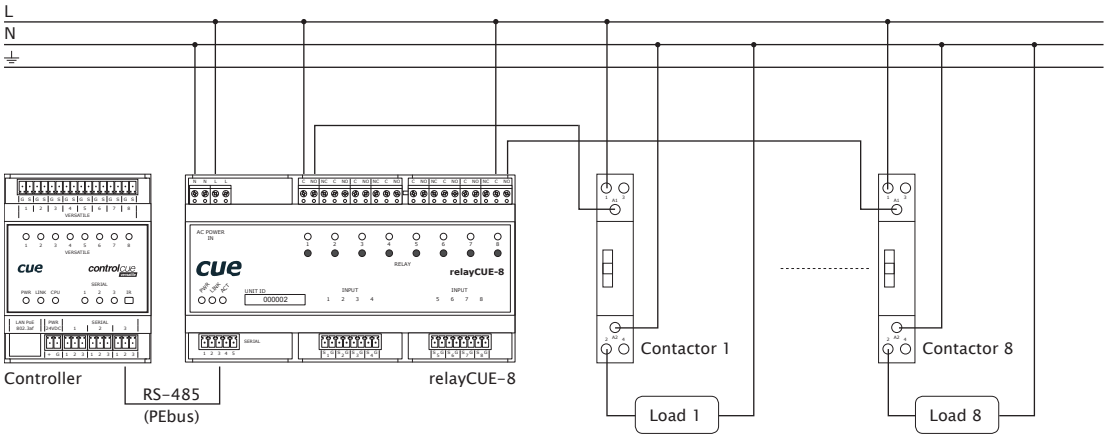
Contactors equipped with 230 V coil can be driven by power relays. See the following table for details.

Unit	Number of Controlled Contactors	Contactor Coil Voltage	Maximum Load per Contactor Coil
ipCUE-sigma	8	230 VAC	550 W
relayCUE-8	8	230 VAC	384 W
powerAUX	8	230 VAC	550 W
PER610	6	230 VAC	384 W

The following picture describes how to drive 2-pole contactors by ipCUE-sigma.



The following picture describes how to drive 2-pole contactors by relayCUE-8.



Power Sockets

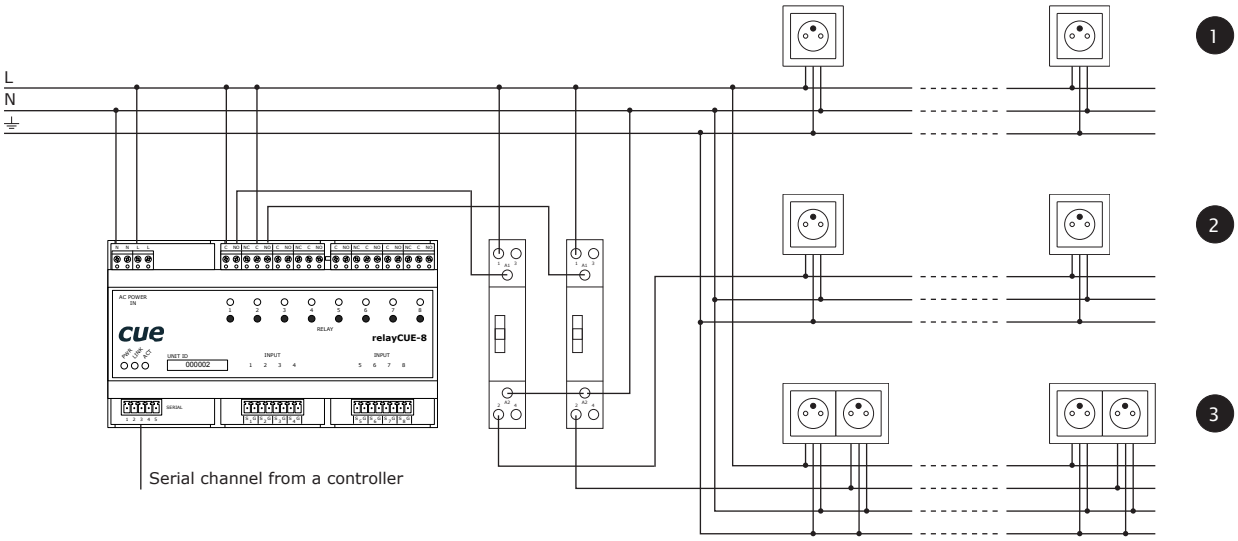
Overview

A switch-controlled power socket (outlet) is a great way to control appliances. It makes it possible to switch appliances on and off depending on the house status (at home, sleep, away). It provides greater convenience and safety in the home and reduces energy consumption.

The load type connected to a power socket is generally unknown – it can be resistive, inductive or capacitive. That's why it is strictly recommended to use contactors as described in previous section.

Connection

The following picture describes three socket circuits with various functionality.



1	This socket circuit is un-switched, all socket are permanently supplied. Suitable for appliances that need permanent power supply, for example refrigerators, ovens, network units, etc.
2	This socket circuit is switched by contactor 1. These sockets are suitable for appliances which must be switched off when one is away, for example iron, cofee maker, etc.
3	Double sockets with unswitched and switched socket. The left socket is unswitched, the right socket is switched by contactor 2. Suitable for places where permanent and switched power supply is needed, for example living room AV, places where chargers are connected, etc.

The following units can be used for power socket switching:

- ipCUE-sigma
- relayCUE-8
- poweAUX
- PER610

Lighting Control

Introduction

Overview

Light control is the capability to set the level and quality of light in a given space for specific tasks or situations.

Controlling light properly enhances the experience and it is one of the easiest ways to save on energy costs. The right lighting control solution slashes your lighting costs by 50% compared to traditional systems.

Most light controls are simple on-and-off switches. This means that fixtures are putting out the exact same amount of light in the middle of the day as during the night. Through dimming, users can control the quantity of fixtures light to fit specific tasks, moods or situations.

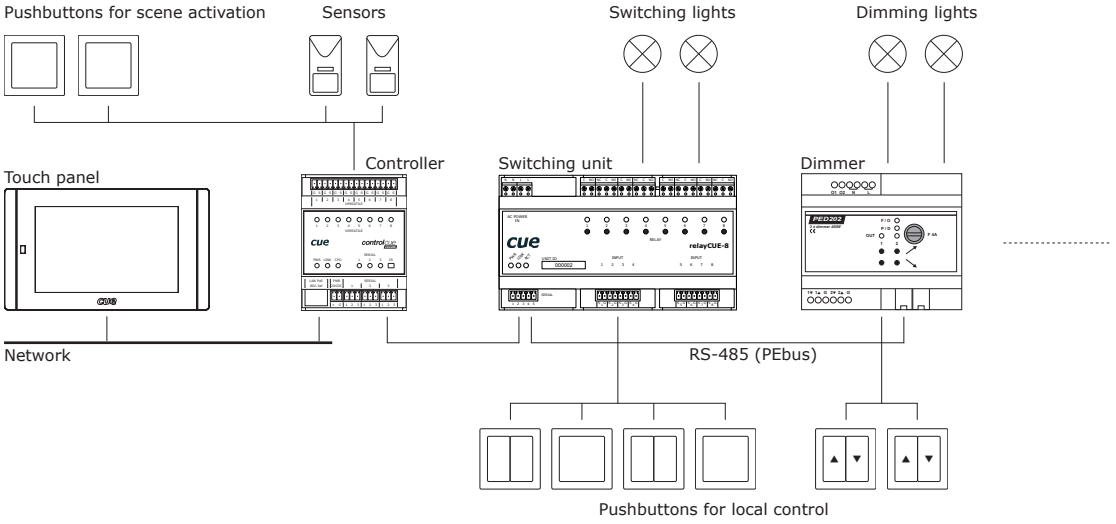
A controller is programmed with each area's occupation patterns. A light sensor allows the lights to be switched on, via the controller, when the natural light levels are too low. The system is flexible enough to allow occupants to override the restriction, switching lights on for short periods of time as needed.

Depending on the configuration, the controller can either automatically switch lights on in a given area in relation to the time of the day, or periodically send lights-off commands when the natural light is high, or when the programmed occupation time is over. Flexible programming ensures optimum balance between energy savings and user comfort.

In the field of light control, the Cue System offers

- Local manual control of light circuits using any standard light pushbutton switch
- Storing unlimited number of user-defined light settings for multiple lights
- Organizing light settings in user-defined zones
- Selecting scene by pressing a single button
- Automation through scheduling of light settings
- Program transition between scenes
- Working in conjunction with security and other systems
- Remote control of all lights with mobile devices
- Automated light shows
- User-defined default light setting for power-up or after power failure
- Easy to use and powerful software for controlling lights and creating user-defined light settings.

Architecture



Lighting Sources

The following table describes the most commonly used lighting sources.

Lighting source	Picture	Description	Load Type
Incandescent Lamps		Line voltage tungsten filament lamps.	Resistive
Halogen Lamps		Line voltage halogen lamps.	Resistive
MLV Lamps (Magnetic Low-Voltage)		Magnetic low-voltage lamps use magnetic transformers step down line voltage to 12 VAC or 24 VAC. Magnetic transformers use copper, wound around a steel core which is inductive by nature. These products are rated in volt-ampere (VA).	Inductive
ELV Lamps (Electronic Low-Voltage)		Electronic low-voltage lamps use electronic transformers step down line voltage to 12 VAC or 24 VAC. This is done with electronic circuitry which is capacitive by nature. Electronic transformers are compact and lightweight. Due to the higher efficiency of ELV transformers, these products are rated in watts (W), which is the lamp load connected to the transformer.	Capacitive
Fluorescent Lamps (FL)		Low pressure mercury vapor gas discharge lamp that uses fluorescence to produce visible light.	Inductive
Compact Fluorescent Lamps (CFL)		Line voltage fluorescent lamp designed to replace an incandescent lamp.	Capacitive
LED Lamps		Line voltage LED product that is assembled into a lamp (or light bulb) for use in lighting fixtures. The bases of these bulbs have integral drivers that determine if they are dimmable, and if so, what the dimming performance is.	Capacitive
Low-Voltage LEDs CV (Constant Voltage)		Typically dimmable LED strips powered by low voltage 12 or 24 VDC.	Capacitive for driver input Resistive for low-voltage output
Low-Voltage LEDs CC (Constant Current)		LED arrays dimmable by controlled current. Typically used for down-lights.	Capacitive for driver input Resistive for low-voltage output

Switching Lights

Line Voltage Lighting Sources

Maximum Loads by Lighting Source

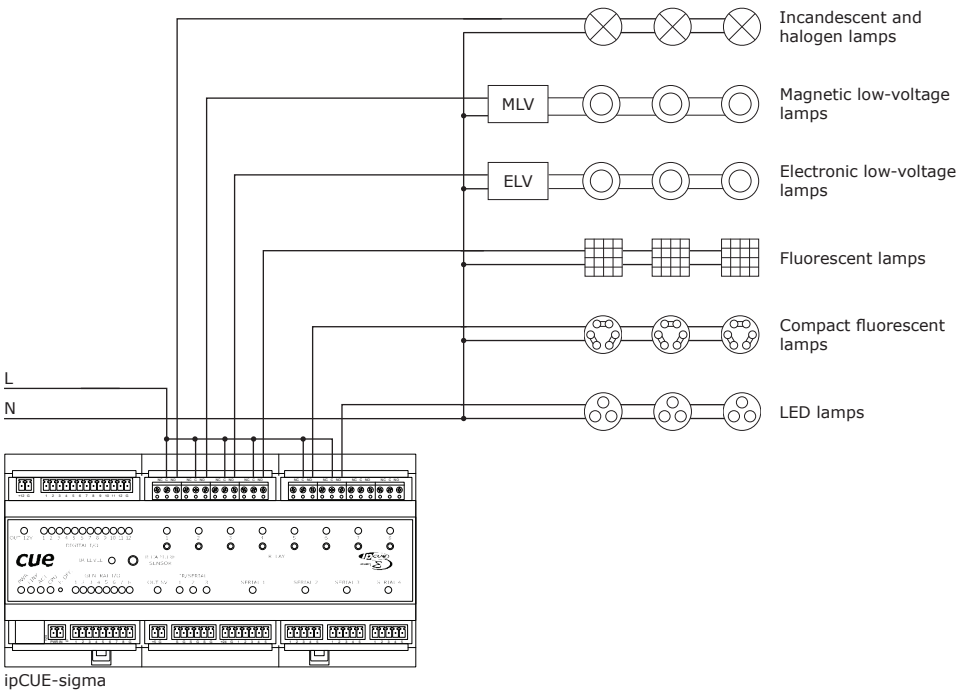
The following table summarizes the maximum load for one relay.

Lighting Source	Load Type	ipCUE-sigma	relayCUE-8	powerAUX	PER610
Incandescent Lamps	Resistive	250 VAC / 16 A	250 VAC / 10 A	250 VAC / 16 A	250 VAC / 10 A
Halogen Lamps	Resistive	250 VAC / 16 A	250 VAC / 10 A	250 VAC / 16 A	250 VAC / 10 A
MLV Lamps (Magnetic Low-Voltage)	Inductive	250 VAC / 4 A	250 VAC / 2 A	250 VAC / 4 A	250 VAC / 2 A
ELV Lamps (Electronic Low-Voltage)	Capacitive	250 VAC / 16 A	250 VAC / 10 A	250 VAC / 16 A	250 VAC / 10 A
Fluorescent Lamps (FL)	Inductive	250 VAC / 4 A	250 VAC / 2 A	250 VAC / 4 A	250 VAC / 2 A
Compact Fluorescent Lamps (CFL)	Capacitive	250 VAC / 16 A	250 VAC / 10 A	250 VAC / 16 A	250 VAC / 10 A
LED Lamps	Capacitive	250 VAC / 16 A	250 VAC / 10 A	250 VAC / 16 A	250 VAC / 10 A

Maximum inrush currents are as described in the following table.

	ipCUE-sigma	relayCUE-8	powerAUX	PER610
Max. inrush current	30 A	80 A / 20 ms	30 A	80 A / 20 ms

Connection



ipCUE-sigma

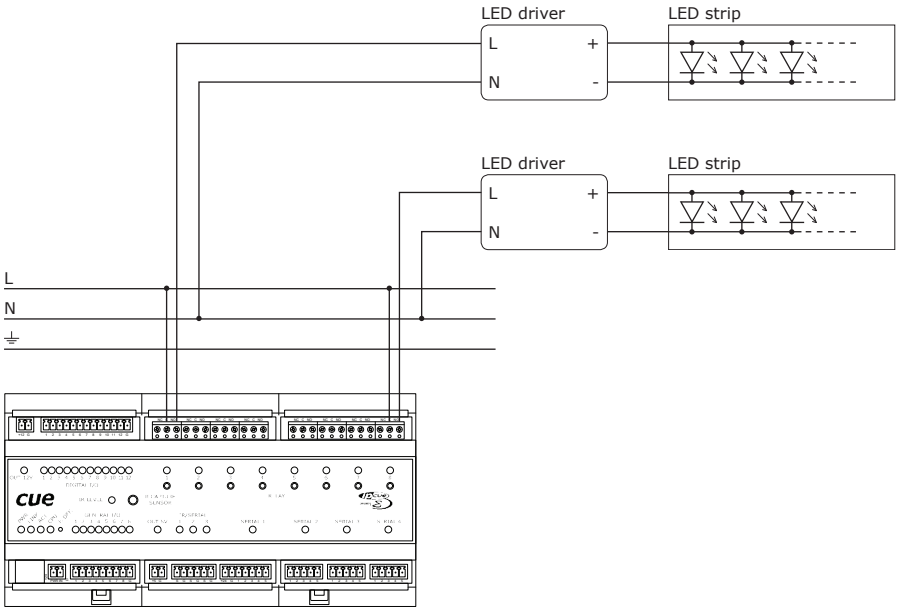
Up to eight light circuits can be switched independently. The ipCUE-sigma is a full-fledged controller allowing to create presets, scenes, etc. Direct connection to the Ethernet provides connection with touch panels, other controllers, interfaces, etc.

The controller has inputs for connection of up to 20 standard wall-mounted pushbuttons or sensors. A push on each button controls one light circuit or activates or de-activates a user-defined light scenario. These pushbuttons make it possible to control the lighting in the traditional way with standard wall-mounted buttons. The pushbuttons make the controller fully operational as a stand-alone unit without being connected to a network.

Low-Voltage LEDs

Line Voltage Switching

The following picture describes the switching of LED power supplies on the input side. This is typically the capacitive load type.



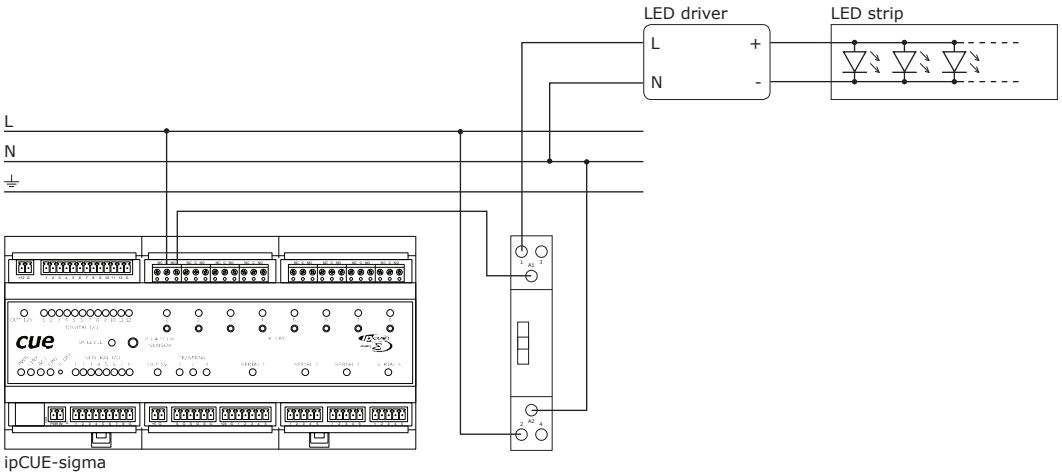
ipCUE-sigma

These power supplies have high inrush currents which can cause damage to the contacts of the switch. Inrush current refers to the input current of short duration that flows into the driver during the initial start-up to charge the capacitors on the input side. Typically, this is a short duration current, whose amplitude is much greater than the operating or steady-state current. Inrush current (cold start) is usually included in LED driver input specifications.

Maximum rated loads and maximum inrush currents are as described in the following table.

	ipCUE-sigma	relayCUE-8	powerAUX	PER610
Max. rated load	250 VAC / 16 A	250 VAC / 10 A	250 VAC / 16 A	250 VAC / 10 A
Max. inrush current	30 A	80 A / 20 ms	30 A	80 A / 20 ms

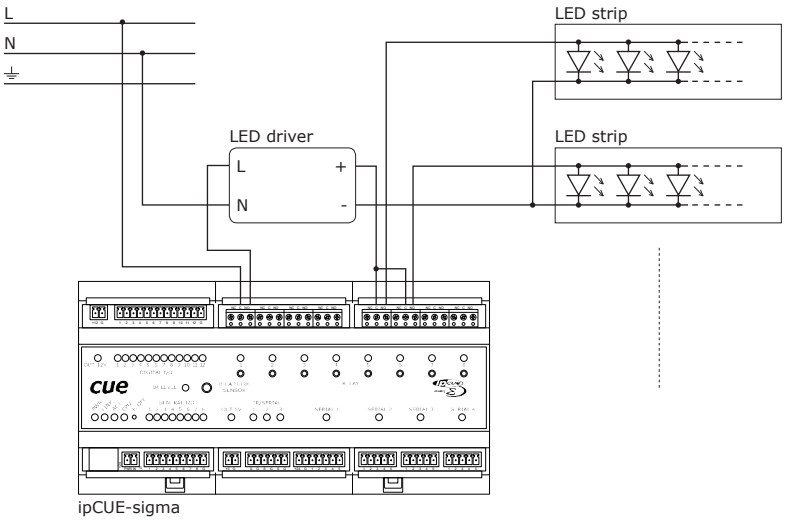
For higher rated current and inrush current it is necessary to use contactors connected to relay outputs.



ipCUE-sigma

Low-Voltage Switching

The following picture describes how to switch LEDs on LED power supply (driver) output.



Relay 1 switches input of LED driver as described in previous section. Relays 5, 6, ... switch low-voltage output of LED driver.

Maximum rated loads for DC switching are as described in the following table.

Lighting source	ipCUE-sigma	relayCUE-8	powerAUX	PER610
Max. rated load	max. 30 VDC / 16 A	max. 30 VDC / 10 A	max. 30 VDC / 16 A	max. 30 VDC / 10 A

Dimming Lights

Overview

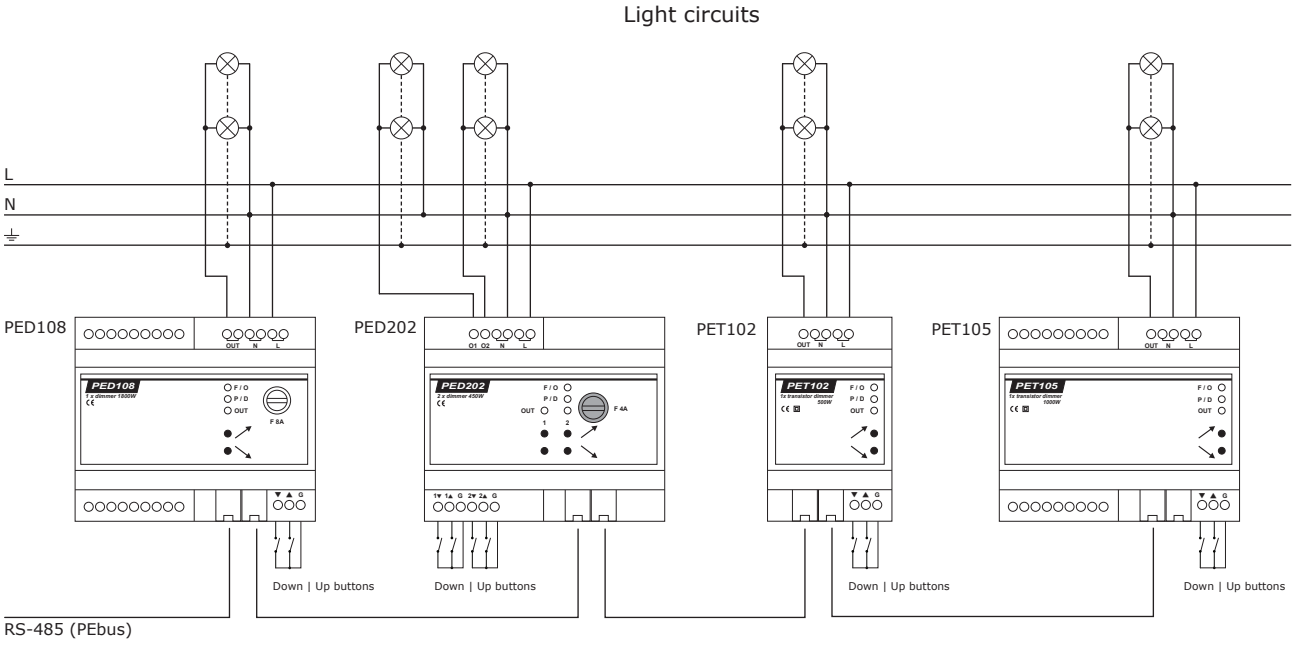
Each type of lighting source (load type) has its own individual characteristics, which require special types of dimmers. It is important to use a dimmer that is designed for the particular lighting source (load type).

For more information on dimming outputs see the chapter System Architecture / Control Ports / Dimming Output.

Incandescent and Halogen Lamps

These resistive loads can be dimmed by the following units:

- PED108 is a one-channel dimmer up to 8 A.
- PED202 is a two-channel dimmer up to 2.7 A per channel. Maximum total load is 4 A.
- PET102 is a one-channel dimmer up to 2 A.
- PET105 is a one-channel dimmer up to 5 A.

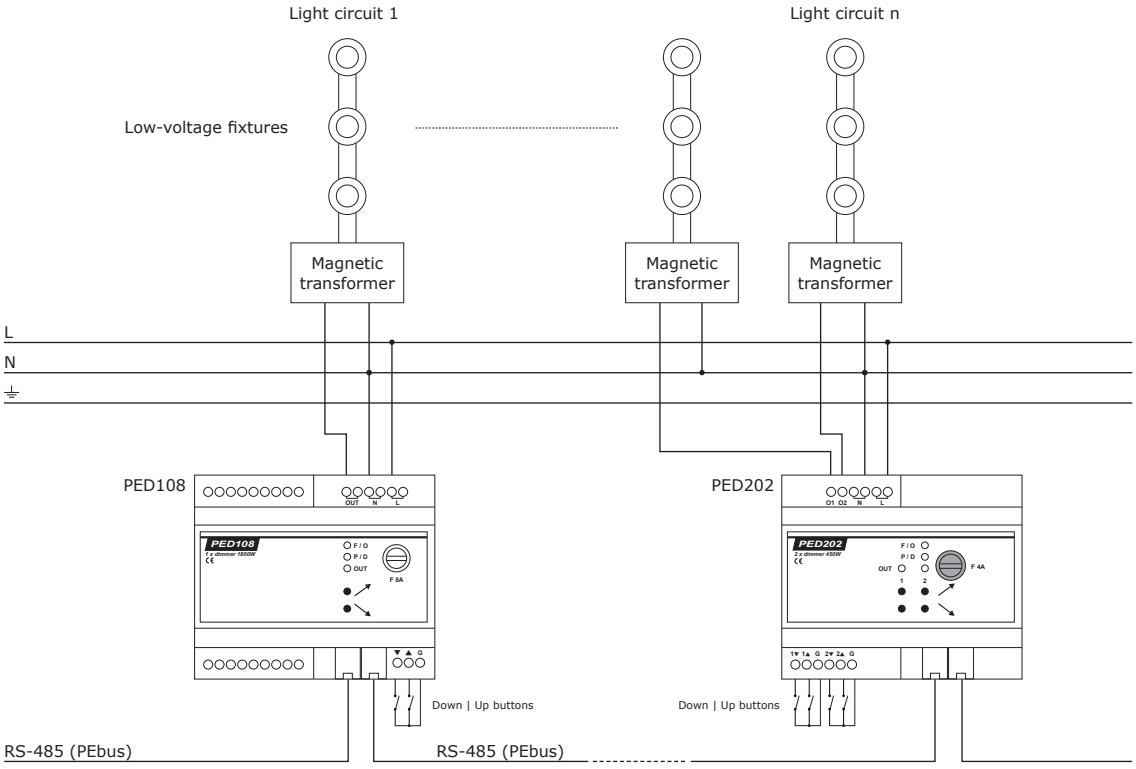


MLV Lamps (Magnetic Low-Voltage)

When dimming a low-voltage fixture, the dimmer controls the line voltage input of the magnetic (core and coil) transformer powering the low-voltage fixtures.

Magnetic transformers are inductive loads dimmable by the following units:

- PED108 is a one-channel dimmer up to 8 A.
- PED202 is a two-channel dimmer up to 2.7 A per channel. Maximum total load is 4 A.

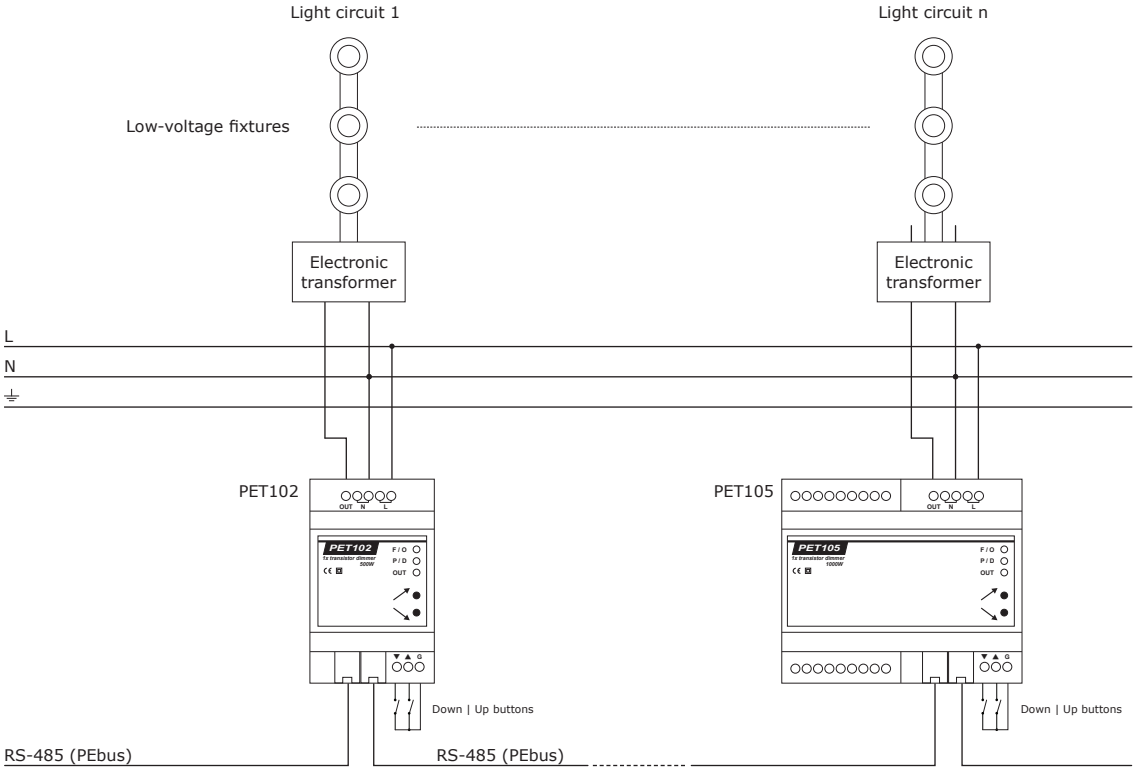


ELV Lamps (Electronic Low-Voltage)

When dimming a low-voltage fixture, the dimmer controls the line voltage input of the electronic (solid-state) transformer powering the low-voltage fixtures. The electronic transformer must be noted that it is dimmable.

Electronic transformers are capacitive loads dimmable by the following units:

- PET102 is a one-channel dimmer up to 2 A.
- PET105 is a one-channel dimmer up to 5 A.



Fluorescent Lamps

Overview

Fluorescent lamps are dimmed using a special dimmable electronic ballast. These ballasts are connected to a control system through standard interface.

Control Interface

The dimmable electronic ballasts are mostly controlled by the following interfaces:

- DALI
- DMX512
- KNX
- DSI
- Analog output 0 – 10 V

All these methods are described in the following chapters.

Electronic Ballasts

While magnetic dimmable ballasts do exist, almost all dimmable ballasts these days are electronic. Electronic ballasts vary in the frequency at which they run the lamps without changing the electrode voltage and are therefore able to achieve a much wider range of dimming. Where magnetics were doing really well to get lamp output down to 20 – 40 %, electronic ballasts can dim down to 1 % on some models.

Electronic ballasts usually operate in the 32 kHz range. This has been known to cause other problems occasionally increased line harmonics and interference with infrared control devices.

It is important to note when dimming fluorescent lamps, that it is impossible to create a smooth transition between off and minimum level. Because light is generated by a discharge through gas, there will always be a jump in the light level when the tube initially strikes. The brightness to which the level jumps is determined by the ballast.

DALI Control

For more details see the section Standard Buses / DALI.

DMX512 Control

For more details see the section Standard Buses / DMX512.

KNX Control

For more details see the section Standard Buses / KNX.

DSI Control

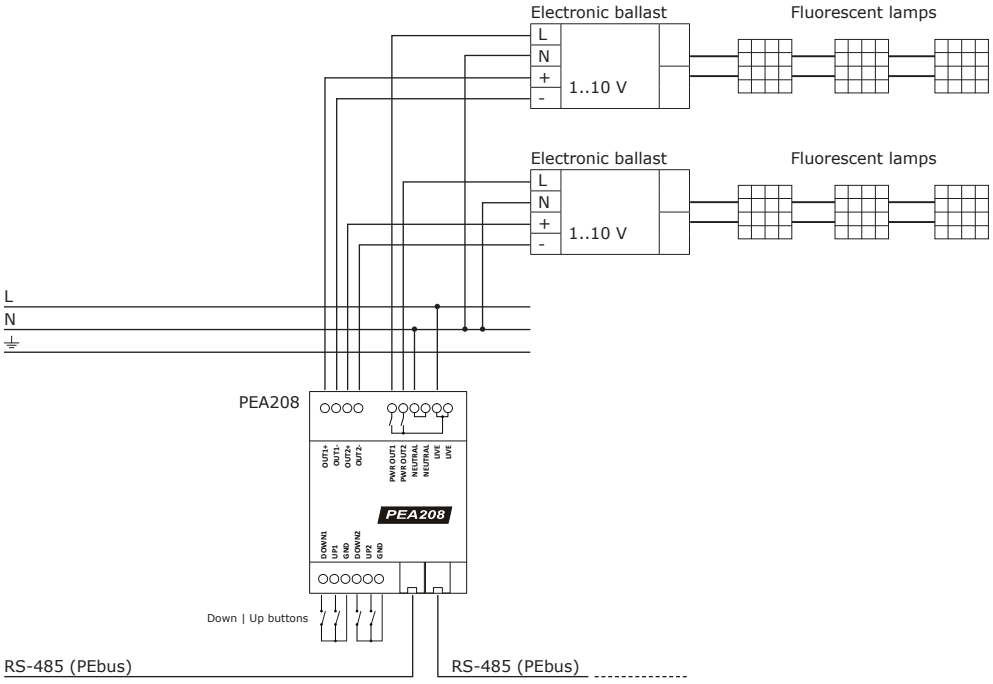
For more details see the section Standard Buses / DSI.

Analog Output 0 - 10 V

The PEA208 interface is a two-channel analog output 0 – 10 V interface. Analog outputs have 10-bit resolution (1024 levels). The sink current can be up to 100 mA at each output.

The unit has two switching outputs (max. 8 A) which is automatically switched when the analog output voltage exceeds 1 V (for power supply of controlled device).

The unit features PEbus and contact closure control. Programmable parameters are inputs response, min. and max. value of output voltage and ramp time.



CFL (Compact Fluorescent Lamps)

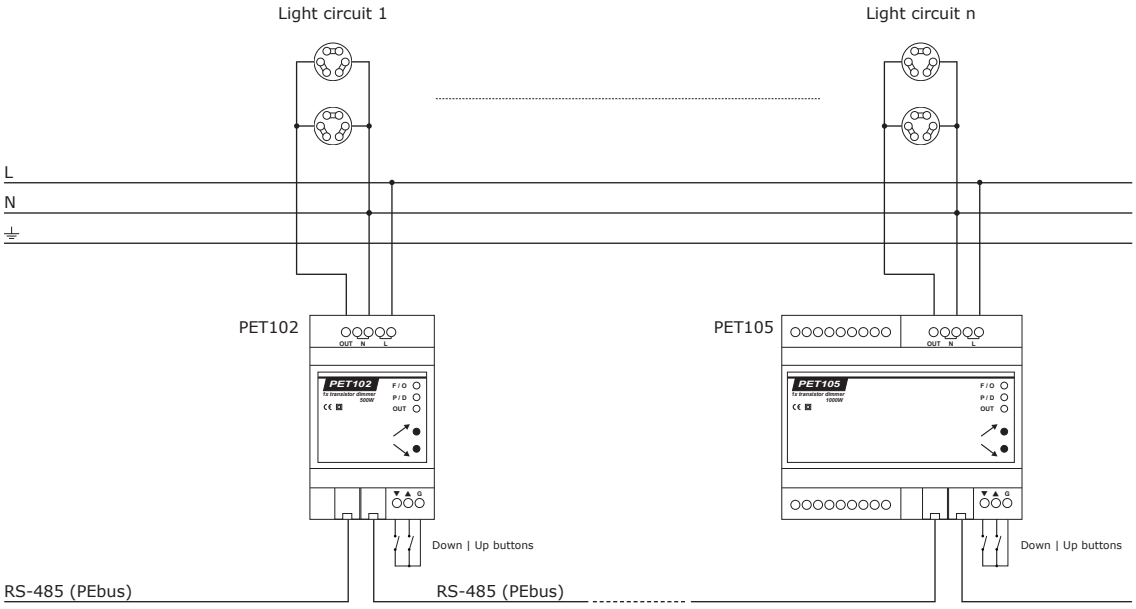
CFL are solid-state products that use a tube which is curved or folded to fit into the space of an incandescent bulb, and a compact electronic ballast in the base of the lamp.

Only some compact fluorescent lamps are dimmable. The dimming range of CFLs is usually between 20% and 90%. For dimming use CFLs marked with the “Dimmable” label, for example

Compact fluorescent lamps are typically a capacitive type of load. For dimming it is necessary use the reverse phase (trailing edge) control.

Dimmable CFLs can be dimmed by the following units:

- PET102 – one-channel dimmer up to 2 A
- PET105 – one-channel dimmer up to 5 A.



LED Lamps

LED lamps are solid-state products that have built-in circuitry (driver) which takes the high-voltage AC input current and converts it to low-voltage DC current to drive the LEDs.

Due to the wide range of line voltage LED lamps product types, not all LED lamps are dimmable, and the ones that can be dimmed may be limited in their dimming performance and system compatibility.

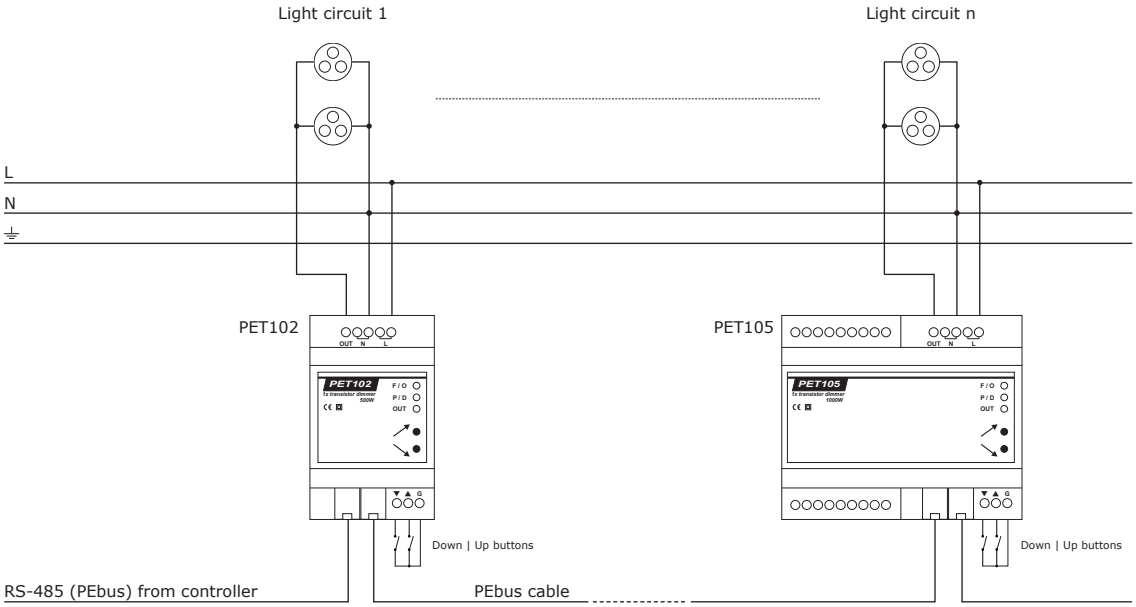
For dimming use LED lamps marked with the “Dimmable” label, for example

Line voltage LED lamps are typically a capacitive type of load. For dimming it is necessary use the reverse phase control. The following issues may occur when a dimmer is incompatible with an LED lamp

- Flickering – may also occur if a non-dimmable lamp is used.
- Drop-out – no light output at the end of the scale
- Dead travel – When the dimmer is adjusted there is no matching change in light output. Light may not dim to an acceptable level.
- Not smooth – Light output may not go from dim to bright linearly.
- Multiple lamps – issues may become apparent when multiple lamps are added.
- Damage or failure – dimmer, circuit or LED is damaged or fails.
- Load below minimum – the power load of the LED lamp is below the minimum required by the dimmer.
- Mixed models – different models of LED are likely to have different drivers. Since drivers behave differently this may result in dimming problems.

Dimmable LED lamps can be dimmed by the following units:

- PET102 – one-channel dimmer up to 2 A
- PET105 – one-channel dimmer up to 5 A.



Low-Voltage LEDs

Overview

Low-voltage LEDs are typically powered and controlled by LED drivers. These drivers are connected to the control system through standard interface.

LED Drivers Control

The LED drivers are mostly controlled by the following interfaces:

- DALI
- DMX512
- KNX
- Analog output 0 – 10 V

All these methods are described in the following chapters.

LED Driver Types

From LED driver output point of view, there are two different types of LED drivers. These two types of drivers are not interchangeable.

- Constant Voltage
  Usual range: 10 V, 12 V, 24 V
  Constant voltage drivers provide constant voltage to one or more LED arrays connected in parallel. A constant voltage driver is used in areas where there is a variable amount of fixtures, such as a cove or under-cabinet light. Here you can keep adding LED arrays to the driver up to the driver's maximum power limit. These are similar and sometimes identical to electronic or magnetic low-voltage power supplies and often have 12 V and 24 V outputs.
  Typically used for cove lights or under cabinet lights.
- Constant Current
  Usual range: 350 mA, 500 mA, 700 mA, 1 A
  Constant current drivers provides a constant current to LED arrays that are designed to operate at or below that current level. A constant current LED driver allows for simpler LED array design because multiple LEDs in a single array are only wired in series.
  Typically used for down-lights.

DALI Control

For more details see the section DALI.

DMX512 Control

For more details see the section DMX512.

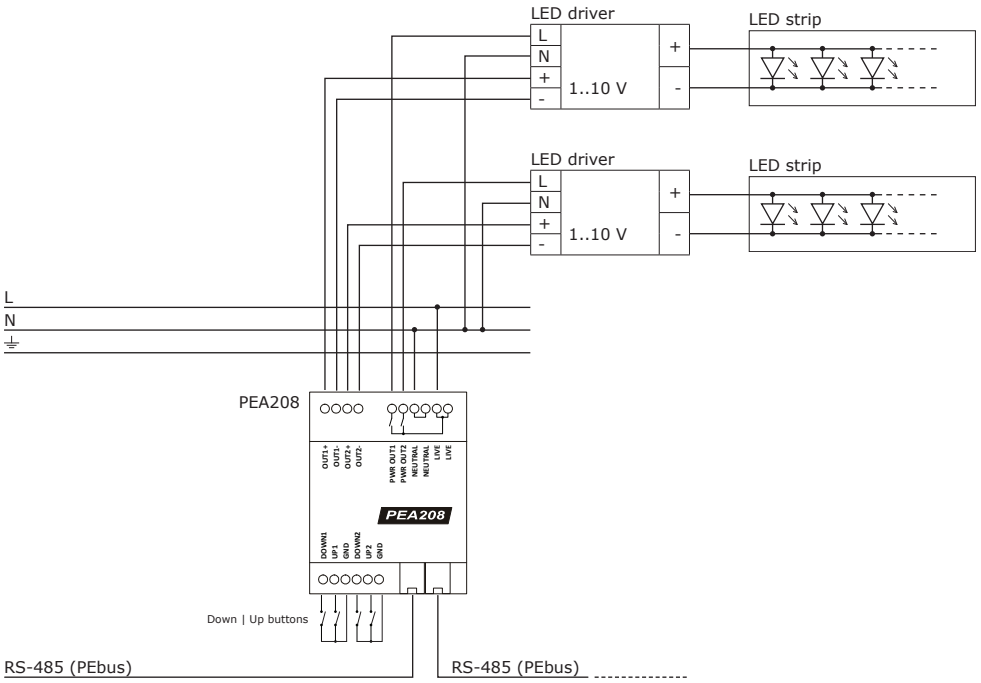
KNX Control

For more details see the section KNX.

Analog Output 0 - 10 V

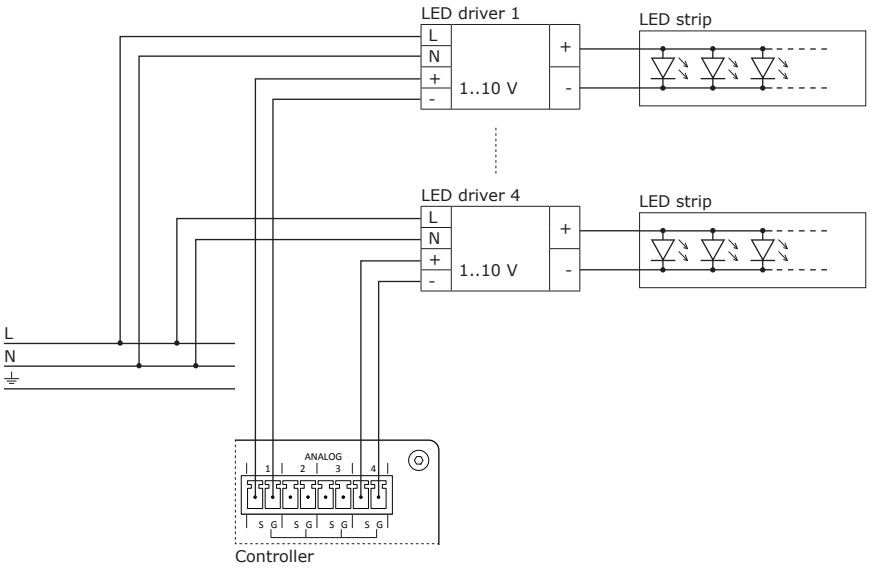
Interface PEA208

PEA208 is a two-channel analog output 0 – 10 V interface. Analog outputs have the 10-bit resolution (1024 levels). The sink current can be up to 100 mA at each output. The unit has two switching outputs (max. 8 A) which are automatically switched on when the analog output voltage is greater than 1 V (for power supply of controlled device). The unit features PEbus and contact closure control. Programmable parameters are inputs response, min. and max. value of output voltage and ramp time.



Controllers

The ipCUE-epsilon and ipCUE-delta controllers are equipped with four analog outputs of 0 – 10 V. The maximum output current (both source and sink) is 10 mA for each analog output. Up to 4 independent LED drivers can be controlled by one controller.



Motor Control

Introduction

Overview

This chapter describes how to control motorized

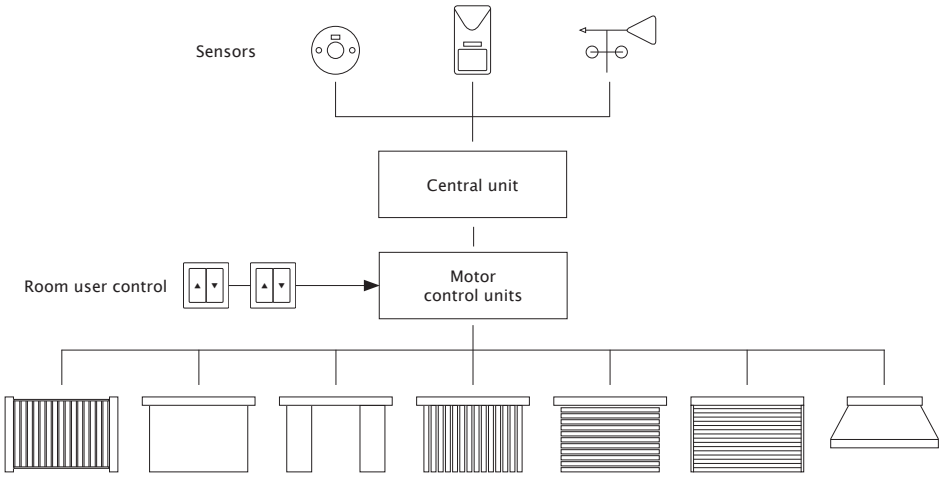
- Gates
- Awnings
- Shutters
- Exterior screens and solar shades
- Blinds
- Shades
- Insect screens
- Curtains
- Draperies
- Projection screens
- AV lifts

Automatic control of blinds and curtains can be used for

- Brightness control
- Glare control
- Privacy
- Temperature control
- Presence simulation
- Security (in case of shutters)

Functionality

The motor control units provide the motors with the required voltage and regulate the priorities between the room user and the central control unit. Motor control units are normally linked with the central control to be able to react to automatic commands like presets, time, sun, wind, etc.



Motor Types

The most commonly used motors are

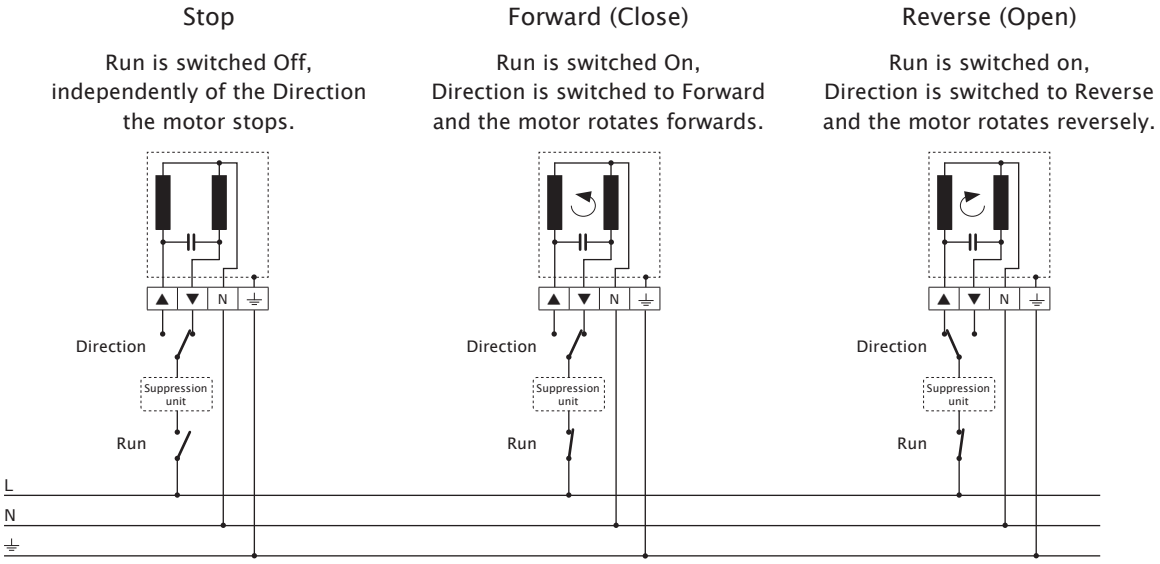
- AC motors – bi-directional asynchronous motors powered by alternating current
- DC motors – bi-directional motors powered by direct current

AC Motors

Introduction

Most of the equipment described above use bi-directional AC asynchronous motors. The cost-effective standard solution is especially used outside and for application with a higher torque.

The following picture describes the principle of direction control. It uses Run switch (relay) and Direction switch (relay).

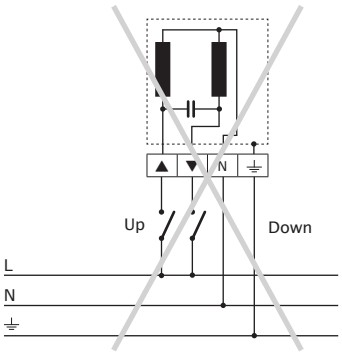

Stop
Run is switched Off, independently of the Direction the motor stops.
Forward (Close)
Run is switched On, Direction is switched to Forward and the motor rotates forwards.
Reverse (Open)
Run is switched on, Direction is switched to Reverse and the motor rotates reversely.
N
Direction
Suppression unit
Run
L
N

Notes

- Motors are equipped with limit switches. However, it is better to switch of the Run relay after reaching the end position. It can be done by appropriate time-out in control application.
- The suppression unit (PES03) can be connected between Run and Direction switch. Suppression unit is recommended when the load is higher than 20 W.

! Warnings

- With this type of drive it is necessary to eliminate simultaneous connection to both phase windings, which can cause damage of the motor. This means the following connection is not allowed.



- Do not wire motors in parallel. Use dedicated relays per motor. In case of parallel connection there will be constant feedback from one motor to another, so stopping points will not be stable and there is a risk of motor burn-out.

Connection

Maximum Loads

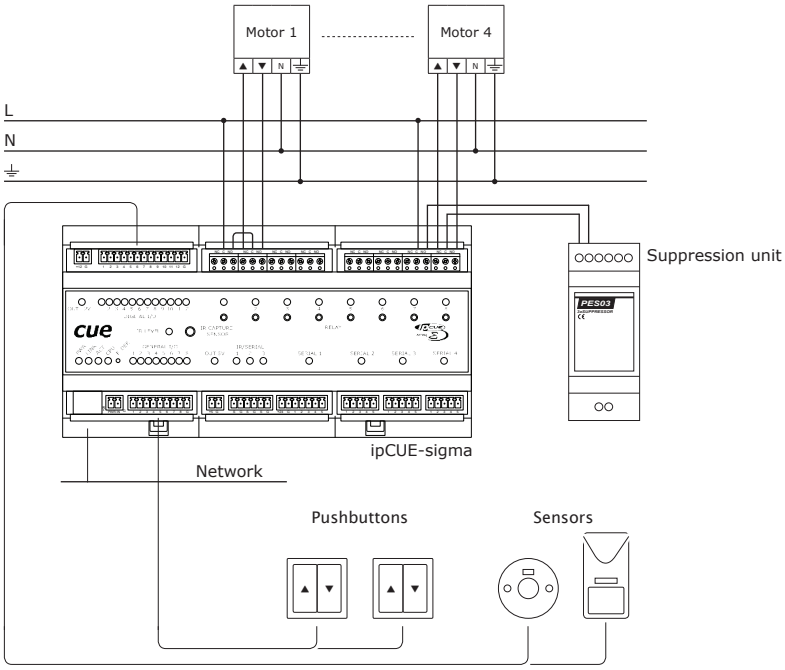
The relay contacts in all units are constructed for inductive loads (motor switching) as described in table below.

Unit	Number of Controlled Motors	Max. Relay Voltage	Maximum Load per AC Motor
ipCUE-sigma	4	230 VAC	550 W
relayCUE-8	4	230 VAC	384 W
powerAUX	4	230 VAC	550 W
PER610	3	230 VAC	384 W

If you need to switch higher loads, use contactors. Unlike relays, contactors are designed with features to control and suppress the arc produced when interrupting.

ipCUE-sigma

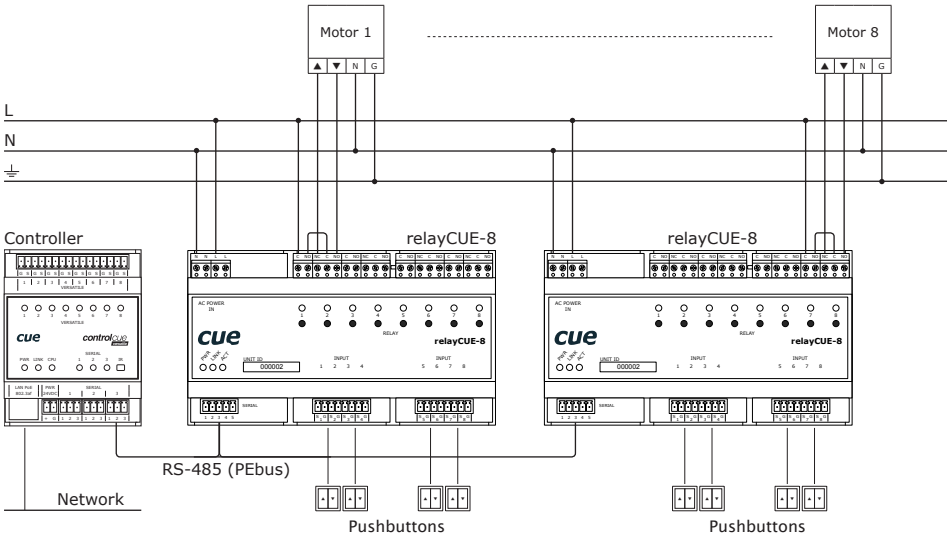
The ipCUE-sigma can control up to four motors independently. It is a full-fledged controller with connection to the Ethernet.



Notes

- The Motor 1 is connected without a suppressor unit. That means the output of Relay 1 (Run) is connected directly to the common contact of Relay 2 (Direction). On the contrary, Motor 4 uses a suppression unit PES03 connected between Relay 7 (Run) and common contact of Relay 8 (Direction).
- The suppression unit contains three RC suppression parts for switching motors and serves for EMI suppression.
- 12 Digital inputs and 8 General I/Os allow connect switches or sensors for local control.
- Each relay can be controlled by a test button on the front panel.
- For higher loads it is necessary to use contactors driven by ipCUE-sigma relays.

relayCUE-8



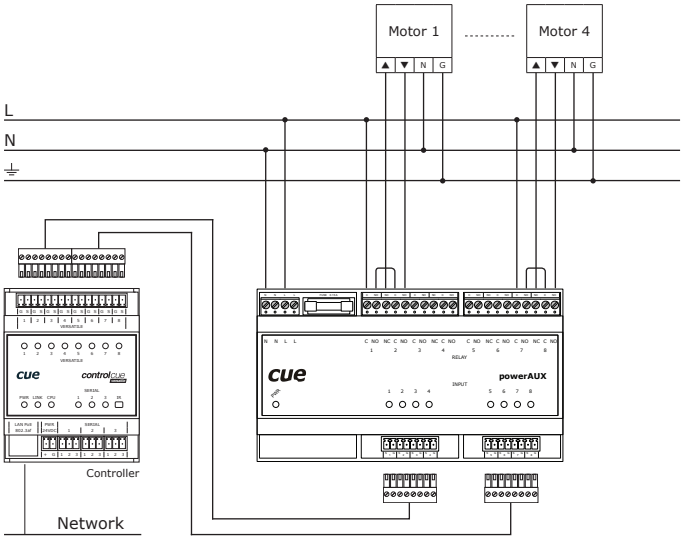
Notes

- Up to 4 motors can be controlled by one relayCUE-8.
- Local manual motor control is provided by standard wall pushbuttons connected to the relayCUE-8 inputs. The pushbuttons Up and Down are independent on a controller and the relayCUE-8 automatically provides motor control logic including the necessary delay when switching relays.
- The relayCUE-8 is connected to a controller by RS-485 (PEbus) serial channel.

powerAUX

The powerAUX is an eight-channel relay switching unit. It may be connected to the controller's general and digital I/Os, versatile ports or relay outputs. Each power relay has a low-voltage input and two (Relay 1, 3, 5, 7) or three (Relay 2, 4, 6, 8) power contacts connected to the terminals. The enclosure allows simple installation on a DIN rail.

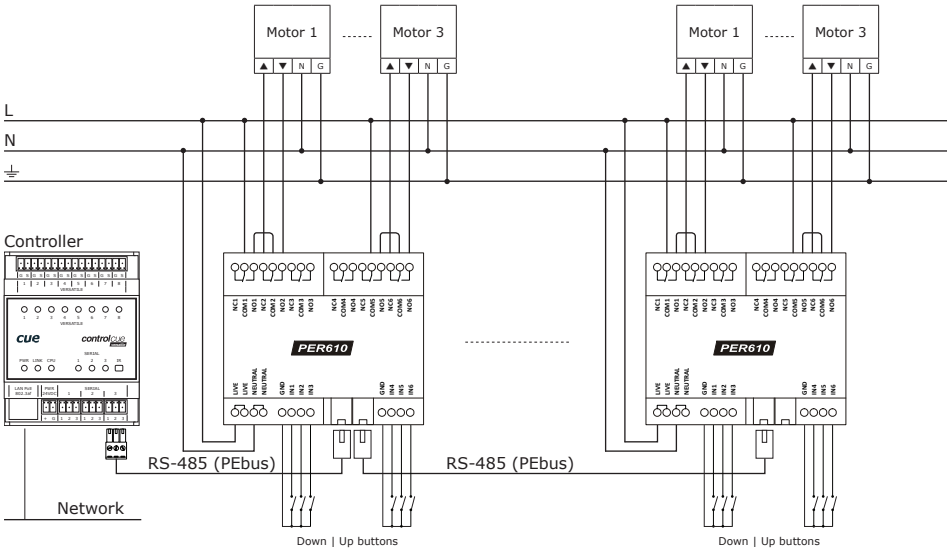
Up to 4 motors can be controlled as described below.



PER610

The PER610 is a six-channel relay switching unit. Each power relay has a low-voltage input and three power contacts connected to the terminals. The enclosure allows simple installation on a DIN rail.

As described below, up to 3 motors can be controlled by one PER610 unit and more units can be connected to the same serial channel RS-485 (PEbus). Local manual motor control is provided by standard wall pushbuttons connected to the PER610 inputs. The pushbuttons Up and Down are independent on a controller and the PER610 automatically provides motor control logic including the necessary delay when switching relays.



Resources

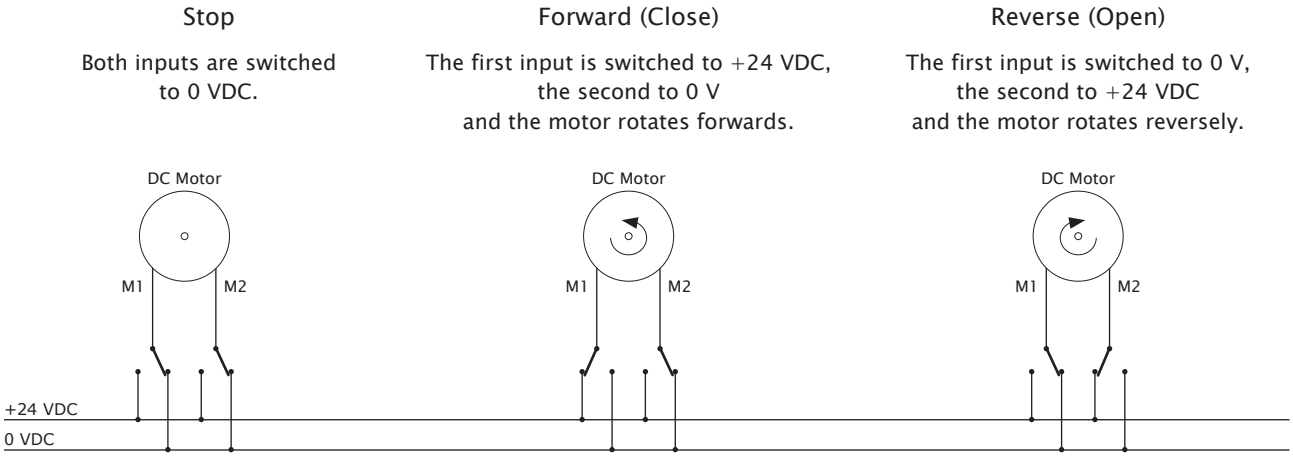
The driver Generic_Bidirectional_AC_Motor is available in Cue Store.

DC Motors

Introduction

DC motors are typically used for motorized shades, drapes, blinds and windows with smaller measurements and lower torque to provide standard up/down or open/close functions.

Typical power supply is 24 VDC and DC motors can be reversed by changing the polarity as described in the following picture. As you can see, every motor needs two relays with NC-C-NO (normal close - common - normal open) contacts.



Notes

- With DC motors, you should be aware of possible voltage drop on the long wires. Cable cross-section depends on power supply, motor consumption and cable length.
- Motors can be connected in parallel. In that case be aware of the maximum load for relay.
- Power supply and breakers depend on the particular motor.

Connection

Overview

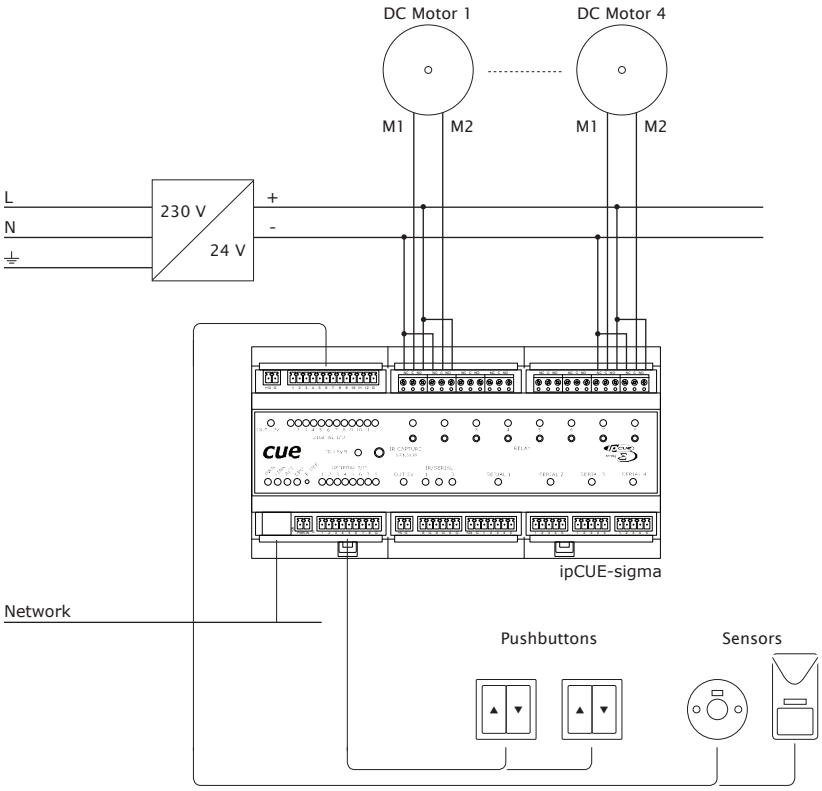
Most DC motors use voltage 24 VDC and the current consumption is 0.3–1 A (shading systems) and 0.3–2.5 A (window motors). Low-voltage relays can be used for motors 24 VDC, max. current 0.5 A. For higher loads it is necessary to use more powerful relays. In some cases external relays controlled by low-voltage relays or general I/Os can be used.

The following table lists all units which can be used for direct DC motor control, utilization category DC-23 – Switching of highly inductive loads (i.e. series motors).

Unit	Number of Controlled Motors	Maximum load per motor
ipCUE-sigma	4	Max. 30 VDC / 60 W
relayCUE-8	2	Max. 30 VDC / 40 W
powerAUX	2	Max. 30 VDC / 60 W
PER610	3	Max. 30 VDC / 40 W

ipCUE-sigma

The ipCUE-sigma can control up to four motors independently – two relays are used for each DC motor. It is a full-fledged controller with connection to the Ethernet.

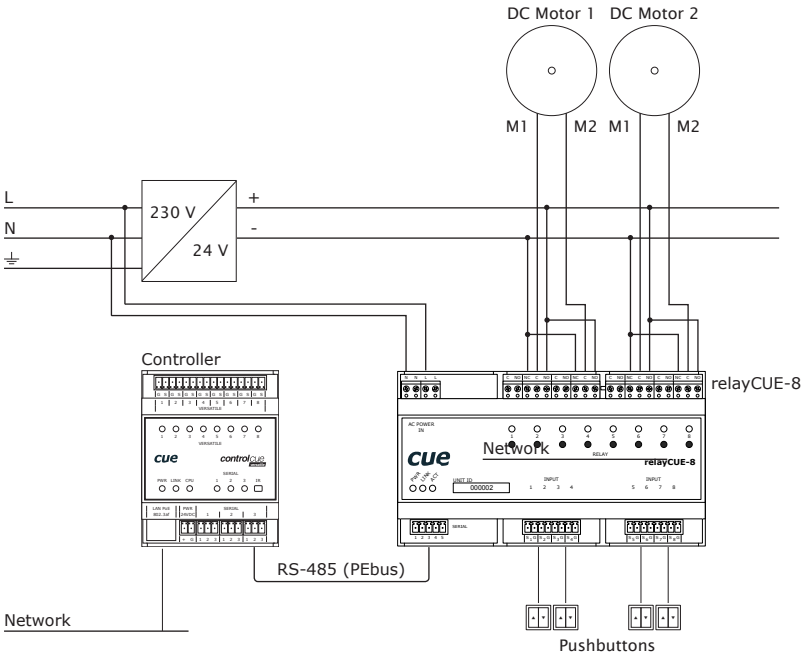


Notes

- 12 Digital inputs and 8 General I/Os allow to connect switches or sensors for local control. They make it possible to create distributed system with local control.
- Each relay can be controlled by a test button on the front panel.
- For higher loads it is necessary to use contactors driven by ipCUE-sigma relays.

relayCUE-8

The relayCUE-8 is an eight-channel relay switching unit. Up to 2 DC motors can be controlled by one relayCUE-8, because there are only 2 relays NC-C-NO. The unit features RS-485 (PEbus) and contact closure control. Local manual motor control is provided by standard wall pushbutton switches connected to relayCUE-8 inputs. It eliminates the necessity to provide control throw central unit.

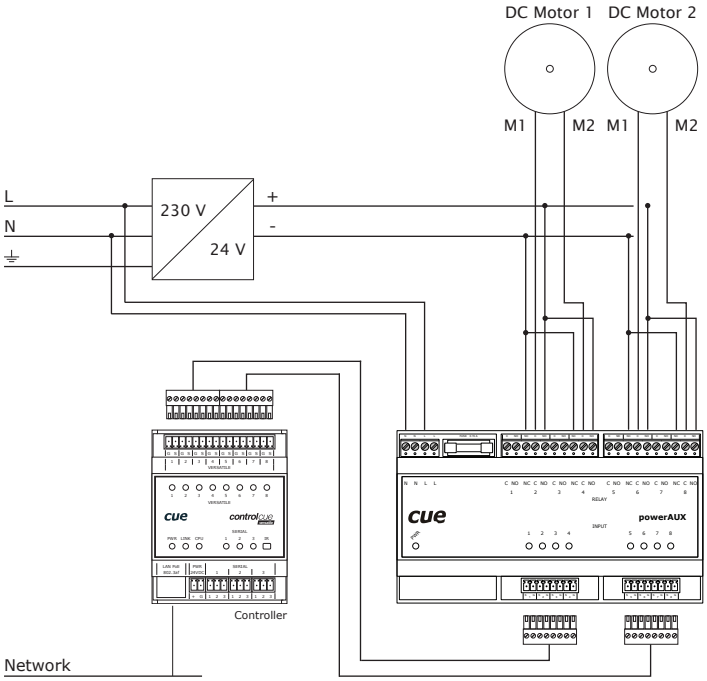


Notes

- Up to 2 motors can be controlled by one relayCUE-8.
- Local manual motor control is provided by standard wall pushbuttons connected to the relayCUE-8 inputs. The pushbuttons Up and Down are independent on a controller and the relayCUE-8 automatically provides motor control logic including the necessary delay when switching relays.
- The relayCUE-8 is connected to a controller by RS-485 (PEbus) serial channel.

powerAUX

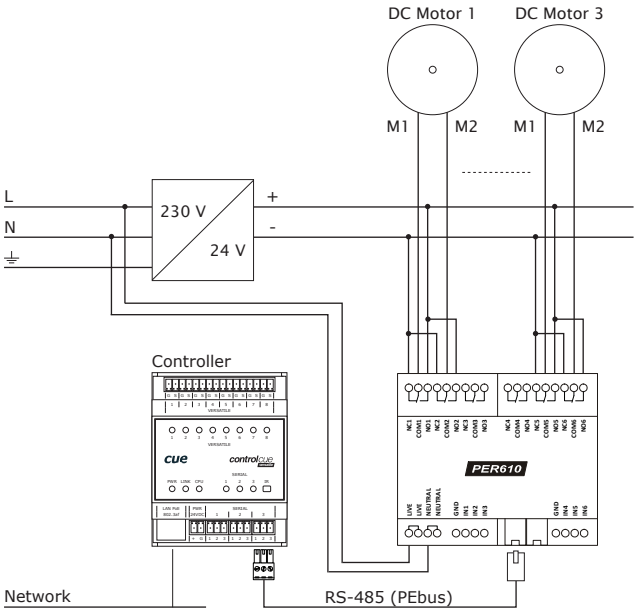
The powerAUX is an eight-channel relay switching unit. It may be connected to the controller's general and digital I/Os, versatile ports or relay outputs. Each power relay has low-voltage input and two (Relay 1, 3, 5, 7) or three (Relay 2, 4, 6, 8) power contacts connected to the terminals. The enclosure allows simple installation on a DIN rail. Up to 2 motors can be controlled as described below.



PER610

The PER610 an six-channel relay switching unit. It may be connected to the controller's RS-485 (PEbus) serial port. The enclosure allows simple installation on a DIN rail.

As described below, up to 3 DC motors can be controlled by one PER610 and more units can be connected to the same serial channel RS-485 (PEbus).



Resources

The driver Generic_Bidirectional_DC_Motor is available in Cue Store.

Sensors and Detectors

Temperature

Introduction

Various types of sensors can be used for temperature measurement and control and the most common ones are the following:

- Platinum sensors
- Thermocouples (T/C)
- Thermistors
- Infra red pyrometers
- Solid state sensors (silicon or germanium)
- Liquid-in-glass (such as mercury thermometers)
- Bimetal (using differential expansion of metals)

Sensors are available in many designs as described in the following table.

Room	Water	Water strap-on	Outdoor	Air duct	Fuel gas

Currently the Cue System offers the following options for temperature measurement:

- Third-party Pt1000 sensors connected to an inputCUE-W temperature sensor input
- sensorCUE as stand-alone unit with a built-in temperature sensor
- sensorCUE-W as stand-alone unit with built-in temperature sensor
- Third-party thermometers connected to serial or IP control port

Pt1000

Introduction

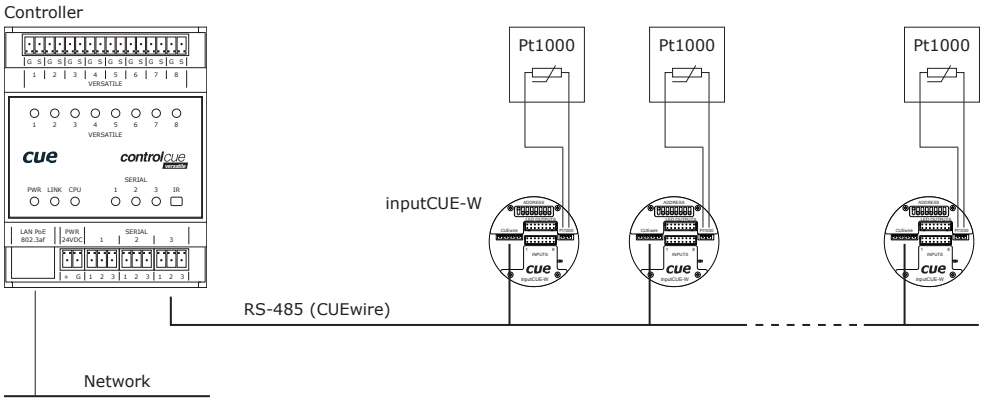
The Pt1000 is a platinum resistance thermometer. Platinum is currently used in all primary resistance thermometers because of its excellent stability and good linearity. Temperature measurement using platinum depends on the fact that its resistance increases linearly with temperature.

Sensor resistance depends on temperature as described in the following table (values for Type 501).

Temperature [°C]	-20	-10	0	10	20	30	40	50	60
Resistance [Ω]	921.6	960.9	1 000.0	1 039.0	1 077.9	1 116.7	1 155.4	1 194.0	1 232.4

Connection

The inputCUE-W connects one Pt1000 temperature sensor and up to eight contacts (for example wall switches) to a control system. The Pt1000 temperature sensor (not delivered with this unit) is connected via 2-pin terminal (Phoenix 3.5 mm).



Pt1000 temperature sensor input is calibrated in the factory with a short cable. If the connection cable of Pt1000 sensor is long, take into consideration that the impedance of the connection cable has influence on the measured value. Every 3.9 Ohm of the cable impedance increases measured value by 1 Celsius degree.

The inputCUE-W enclosure allows simple installation into the standard European electrical wall box.

Programming

The driver for inputCUE-W is part of CVC installation.

Resources

http://www.cuesystem.com/interfaces.aspx

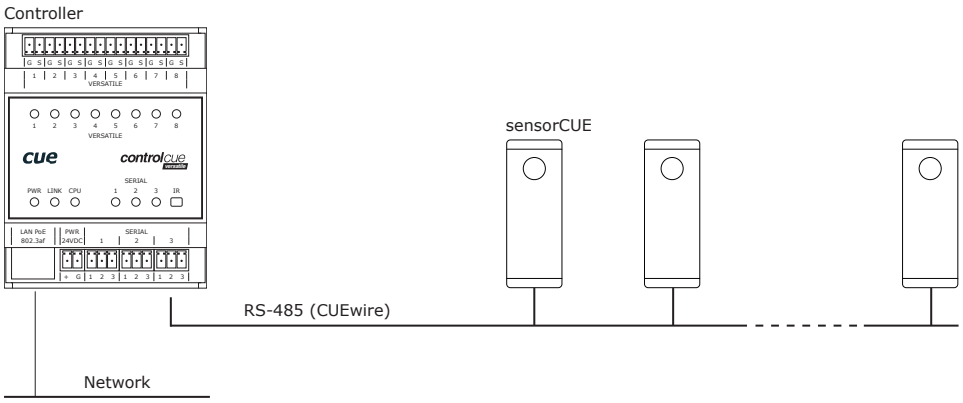
sensorCUE

The sensorCUE is a temperature and daylight sensor in one small metal enclosure.

The temperature sensor with measurement range -55 °C to +125 °C can be used for temperature monitoring and for heating control.

The daylight sensor enables the controller to automatically dim the lights when the available daylight is high and brighten the lights when the daylight is low in order to maintain a specific light level in the space. It may be calibrated for daylight sensitivity by programming the controller.

The unit is fully compatible with CUE controllers and connection is provided via the standard CUEwire system bus. The standard CUEwire is connected via 4-conductor cable, containing the 24 VDC power supply and RS-485 data.



The enclosure of sensorCUE is a small metal box (80 x 30 x 15 mm) which allows simple installation into the environment, for example using double-sided adhesive tape. The temperature and daylight sensors must not be covered so that the functionality of sensorCUE is ensured.

Programming

The driver for sensorCUE is part of CVC installation.

Resources

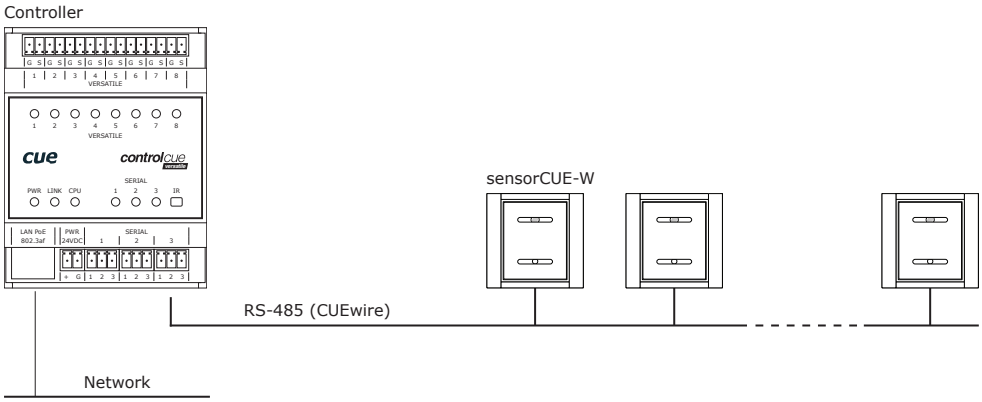
http://www.cuesystem.com/interfaces.aspx

sensorCUE-W

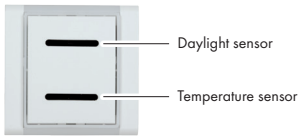
sensorCUE-W is a temperature and daylight sensor for indoor installation compatible with ABB Time or Element design series.

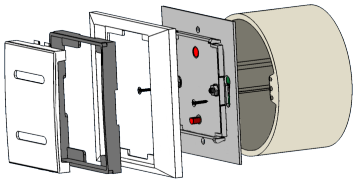
The daylight sensor enables the controller to automatically dim the lights when the available daylight is high, or brighten the lights when the daylight is low in order to maintain a specific light level in the space. It may be calibrated for daylight sensitivity by programming the controller.

The unit is fully compatible with CUE controllers and the connection is provided via the standard CUEwire system bus. The standard CUEwire is connected via 4-conductor cable, containing the 24 VDC power supply and
RS-485 data.



The case of sensorCUE-W is a small plastic box (83 x 81 x 27 mm) which allows simple installation into the standard European electrical wall box. The temperature and daylight sensors must not be covered so that the functionality of sensorCUE-W is ensured.





Programming

The driver for sensorCUE-W is part of CVC installation.

Resources

http://www.cuesystem.com/interfaces.aspx

Thermometers

Introduction

Third-party thermometers convert the signal from one or more temperature sensors to a digital signal in the form of a standard serial format such as RS-232, RS-485 or IP communication. In most cases the standard protocols including Profibus, Modbus, Interbus, CANbus, etc. are used.

Temperature sensors can be internal (built-in) or external (water sensors, probes, etc.)

Bare board thermometer	Interior thermometer	Outdoor thermometer	Thermometer with the probe

Advantages:

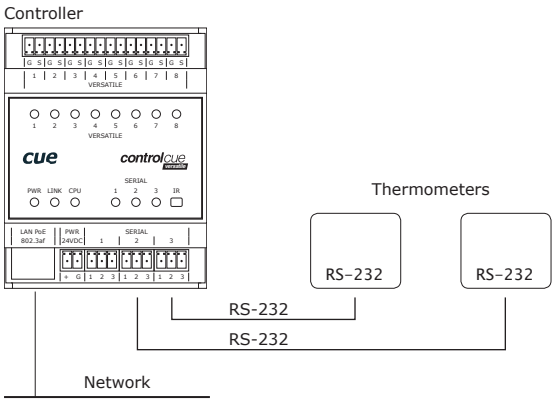
- Convert a low-level sensor output to a digital signal
- Convert a non-linear sensor output to a temperature value
- Reduce the costs of cabling and other instrumentation
- Improve the safety and integrity of temperature measurement

Serial Connected Thermometers

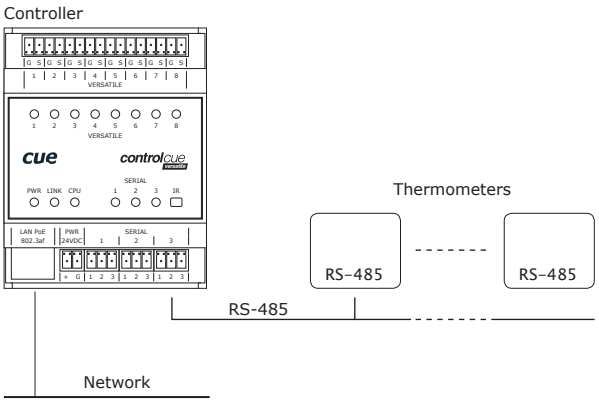
Thermometers are typically connected through RS-232 or RS-485 serial channels. Both standards are supported in Cue System controllers and interfaces.

As described in the following picture, thermometers equipped with RS-232 need one control port for each device. On the other hand, more RS-485 thermometers using the same protocol can be connected to any serial port RS-485. However, this multi-connection must be supported by the communication protocol and it is necessary to study appropriate documentation.

RS-232 communication



RS-485 communication

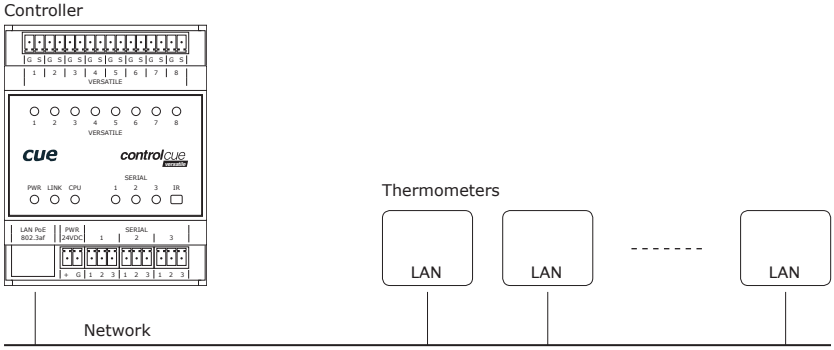


Network Connected Thermometers

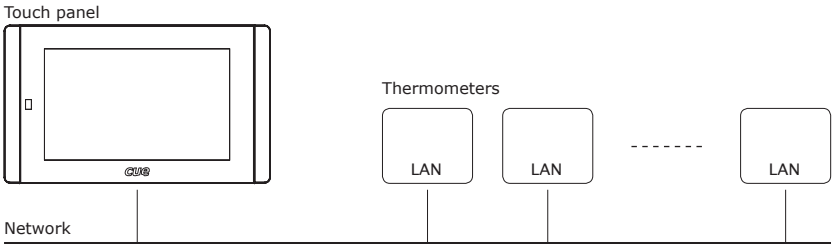
The Cue System allows to control any IP device which can act as UDP/TCP server or client. All controllers and all touch panels support the following communication:

- UDP server
- UDP client
- TCP server
- TCP client

The following diagram describes the use of the controller and the IP thermometers.



The following diagram describes the use of the touch panel with thermometers only. This configuration allows to create a cost-effective distributed control solution where the touch panel serves as a controller and graphic user interface in one box. In Cue Visual Composer, touch panels and controllers are programmed in the same way, which makes it possible to use touch panels as a full-fledged controllers.



Motion Detectors

Introduction

! Warning

The Cue System is not a certified security system. Use for this purpose is fully the responsibility of the system integrator – installer.

Overview

A passive infrared sensor (PIR sensor) is an electronic sensor that measures the infrared light radiating from objects in its field of view. They are most often used in PIR-based motion detectors.

Motion detectors can be used for

- Persons presence monitoring
- Automatic light switching and set scenes
- Automatic equipment and appliances on and off
- Change of the room status by the presence of persons
- Many other functions based on specific conditions and requests

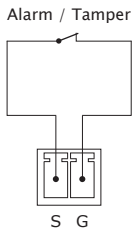
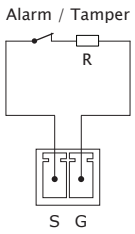
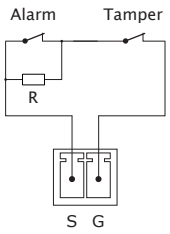
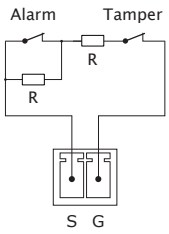
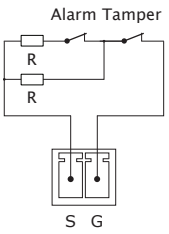
Motion detectors are typically equipped with

- Alarm switch – activated when motion is detected. It provides N.C. (Normal Close) operation, that means active status is opened.
- Tamper switch – designed to stop un-authorised access to the inside of the unit. It usually takes the form of a small micro-switch which is activated when the cover is opened. It provides N.C. (Normal Close) operation, which means the active status is opened.

The standard power supply is 12 VDC.

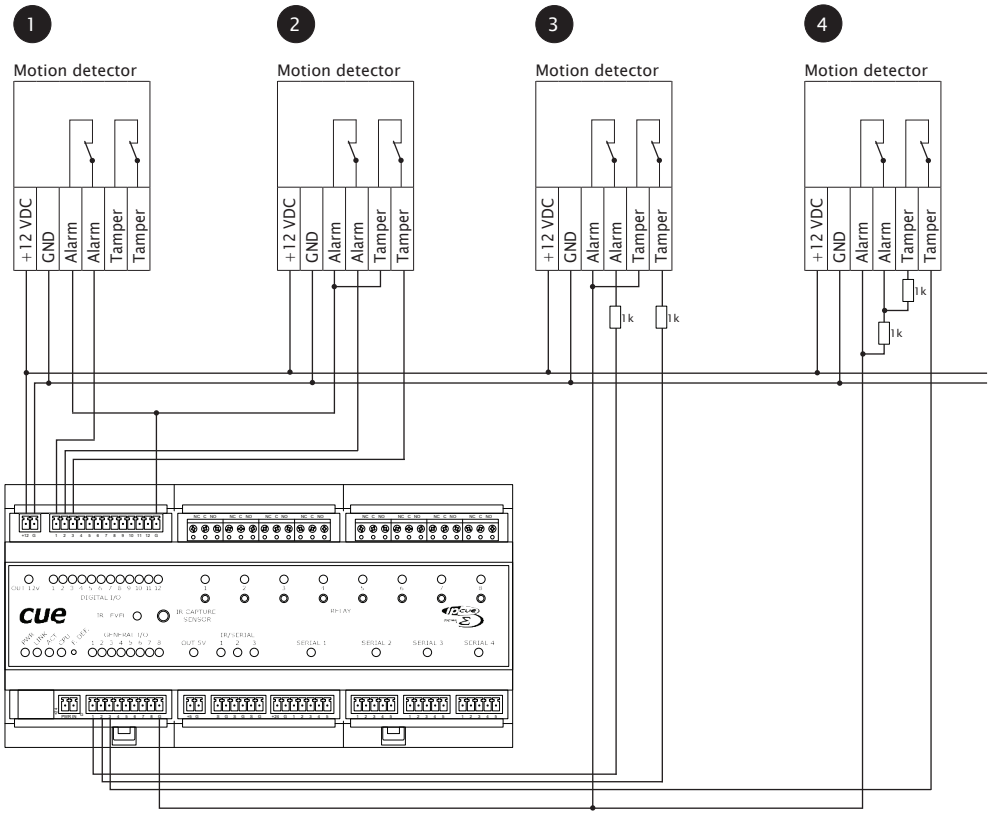
Connection Methods

The motion detectors are typically connected as described in the following table.

	Normally closed	Single balanced loop		Double balanced loop	
					
Standby resistance	0	R	0	R	R/2
Alarm resistance	∞	∞	R	2R	R
Tamper resistance	∞	∞	∞	∞	∞
Description	The non-alarm state is defined as a loop resistance 0. If this value changes, it is regarded as detector triggering. The disadvantage is that cables can be shorted in a fault situation or by sabotage.	The non-alarm state is defined as a loop resistance R or 0. If this value changes, it is regarded as detector triggering. A tolerance of 30% is applied to the measured resistance.		The non-alarm state is defined as a loop resistance R or R/2. If this value changes, it is regarded as detector triggering. Each detector can trigger an alarm due to the intrusion or a tamper signal. Short circuit or open circuit defines a tamper signal. A tolerance of 30% is applied to the measured resistance.	
Usable control ports	Versatile port General I/O Digital input	Versatile port General I/O		Versatile port General I/O	

Connection

The following picture describes how to use ipCUE-sigma for the connection of motion detectors incl. power supply 12 VDC. Other controllers and interfaces equipped with versatile ports, digital I/Os or general I/Os can be used too with the external power supply of 12 VDC.



1	Normally Closed Loop 1 digital I/O per detector	This is a simple connection without the use of tamper contact. Up to 12 motion detectors can be connected to the digital I/Os and, in addition, up to 8 motion detectors can be connected to general I/Os.
2	Normally Closed Loop 2 digital I/Os per detector	This version uses two digital inputs – one for alarm (motion) activation and the other for tamper contact. Both circuits can be checked for interruption constantly, but a circuit can be blocked very simply – by short connection.
3	Single Balanced Loop 2 general I/Os per detector	In this version two independent circuits are used – one for alarm (motion) activation and the other for tamper contact. The idle status is defined by the specific resistance of the circuit which depends on the type of input. Every change of resistance means activation (alarm loop) or sabotage (tamper loop).
4	Double Balanced Loop 1 general I/O per detector	This version allows to use one general I/O (analog input) for the detection of the following conditions: ▪ Idle status – loop resistance is R ▪ Activation – loop resistance is 2 * R ▪ Sabotage – short connection or loop interruption

Note

Resistors used in the schematic diagram can be installed by the manufacturer inside of the detector.

! Warning

Maximum current for the 12 VDC output of ipCUE-sigma is 400 mA. Calculate total current for all detectors and in case 400 mA is exceeded, use external power supply with sufficient power.

Light Sensors

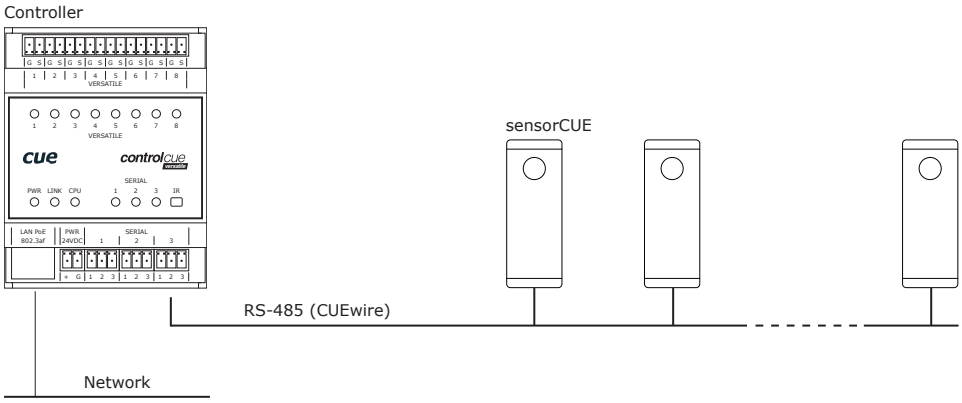
Introduction

Light sensors enable the controller to automatically dim lights when the available daylight is high and brighten lights when the daylight is low in order to maintain a specific light level in the space. It may be calibrated for daylight sensitivity by programming of the controller.

sensorCUE

The sensorCUE is a temperature and daylight sensor in one small metal enclosure.

The unit is fully compatible with CUE controllers and connection is provided via the standard CUEwire system bus. The standard CUEwire is connected via the 4-conductor cable, containing the 24 VDC power supply and RS-485 data.



The enclosure of sensorCUE is a small metal box (80 x 30 x 15 mm) which allows simple installation into the environment, for example using double-sided adhesive tape. The temperature and daylight sensors must not be covered so that the functionality of sensorCUE is ensured.

Programming

The driver for sensorCUE is part of CVC installation.

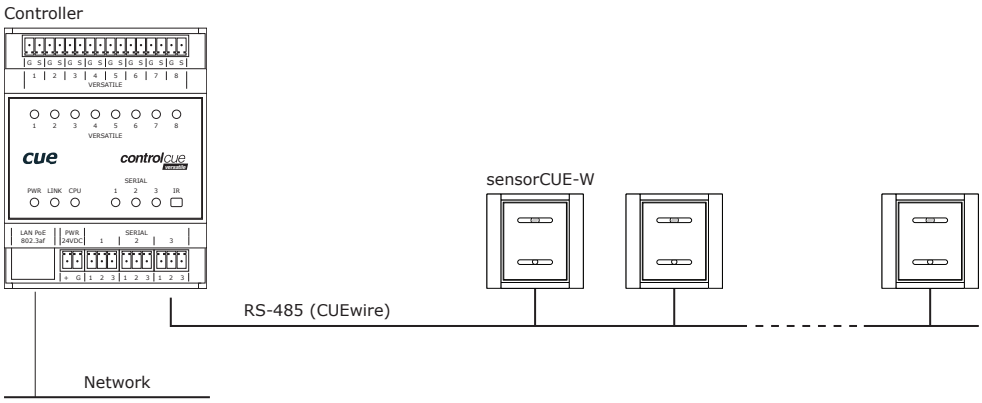
Resources

http://www.cuesystem.com/interfaces.aspx

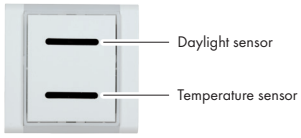
sensorCUE-W

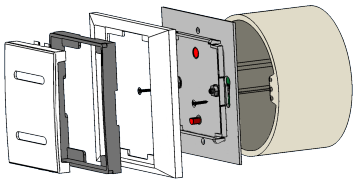
sensorCUE-W is a temperature and daylight sensor for indoor installation compatible with ABB Time or Element design series.

The unit is fully compatible with CUE controllers and the connection is provided via the standard CUEwire system bus. The standard CUEwire is connected via the 4-conductor cable, containing the 24 VDC power supply and RS-485 data.



The case of sensorCUE-W is a small plastic box (83 x 81 x 27 mm) which allows simple installation into the standard European electrical wall box. The temperature and daylight sensors must not be covered so that the functionality of sensorCUE-W is ensured.





Programming

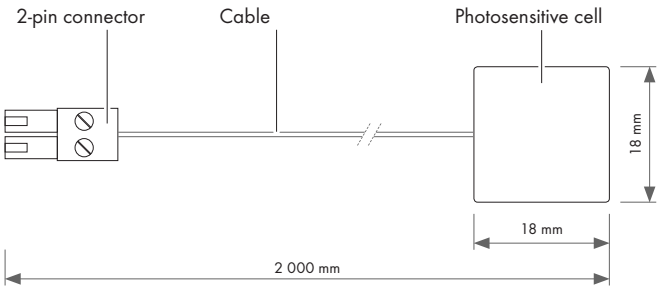
The driver for sensorCUE-W is part of CVC installation.

Resources

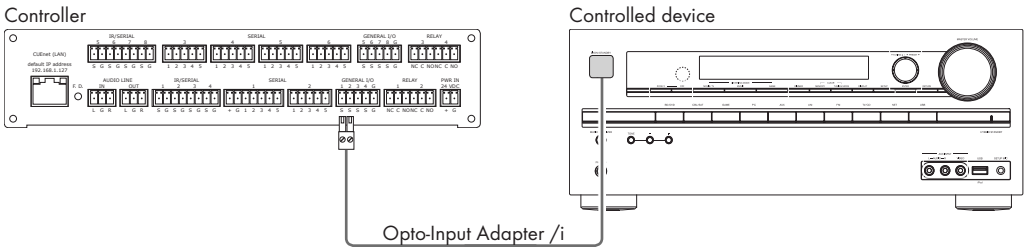
http://www.cuesystem.com/interfaces.aspx

Opto-Input Adapter /i

The Opto-Input Adapter /i is a photosensitive cell with 2 m cable. The status of the light indicator on the controlled device can be read using this adapter.



The Opto-Input Adapter /i is fastened on the indicator using a double-sided adhesive tape.



The Opto-Input Adapter /i can be connected to any controller, touch panel controller and IP interface equipped with one of the following ports:

- Versatile port
- General I/O.

Resources

http://www.cuesystem.com/accessories.aspx

Smoke Detectors

Introduction

Smoke detectors also called smoke alarms are devices that detect smoke, typically as indicators of fire. Commercial, industrial, and mass residential devices issue signal to the fire alarm system, while household detectors, known as smoke alarms, generally issue local audible or visual alarm from the detector itself.

Smoke detectors are typically housed in a disk-shaped plastic enclosure, but the shape can vary by manufacturer or product line. Most smoke detectors work either by optical detection (photoelectric) or by physical process (ionization), while others use both detection methods to increase the sensitivity to smoke.

Sensitive alarms can be used to detect, and thus deter, smoking in areas where it is banned such as toilets and schools. Smoke detectors in large commercial, industrial, and residential buildings are usually powered by a central system, which is powered by the building power with a battery backup. However, in many single family detached and smaller multiple family housings, a smoke alarm is often powered only by a single disposable battery.

Standards

Fire detection products have the European Standard EN 54 Fire Detection and Fire Alarm Systems that is a mandatory standard for every product that is going to be delivered and installed in any country in the European Union (EU). EN 54 part 7 is the standard for smoke detectors.

Connection

Smoke detectors are typically connected to the Versatile ports or General I/Os.

Infra-Red Controlled Devices

How to Get IR Codes

Overview

IR codes are managed using Cue Visual Composer. Every IR-controlled device is described by the IR driver which defines the available functions. IR code data are part of the driver.

IR codes can be got using following methods:

- Using a ready-to-use driver
- Capturing
- Sony SIRC
- ProntoEdit HEX importing
- CCF importing (Component Configuration File)

Discrete Codes

Many IR commands are toggle and these codes do not allow defined device control. For instance, a power button on a remote would be a toggle, in that when it is used the current power state is reversed. If your device is on, it turns off. If it is off, it turns on.

Discrete codes are versions of toggle codes that only perform one function. A discrete code would be a signal that only turns the device on. If it is already on it remains so. These are most often used to ensure components stay completely in sync for powering on and off and changing inputs.

Such specialized and otherwise hidden codes may also be available for direct access to other toggled or rotating functions such as television inputs, receiver sound field settings and on-screen display modes.

Often a remoter that came with a single model of a component may have a few discrete codes that could be used on other similar models. Or the actual structure of an IR code is analysed and then changed to see what the resulting code does.

Entire brands of equipment have been found to have no discrete codes whatsoever. Even if a brand is known to feature some discrete functionality, particular models or lines may not.

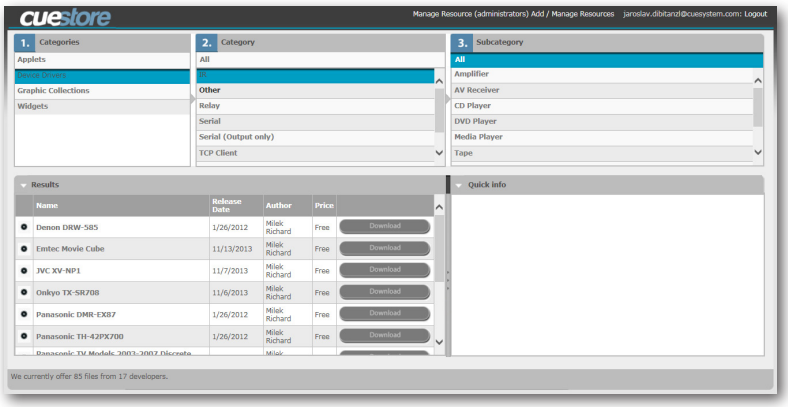
Many discrete codes can be found here: http://www.remotecentral.com.

Ready-to-Use Driver

Ready-to-use drivers are stored in Cue Store. Access to Cue Store is under login.

Go to Cue Store and select

1. Categories - Device Drivers
2. Category - IR
3. Subcategory - All or appropriate device type



Then the appropriate driver can be downloaded and imported to Cue Visual Composer.

Capturing

Overview

Many of CUE touch panels and controllers are equipped with an IR capture sensor and are able to capture IR codes. Captured IR codes can be used in all types of controllers, touch panels and touch panel controllers.

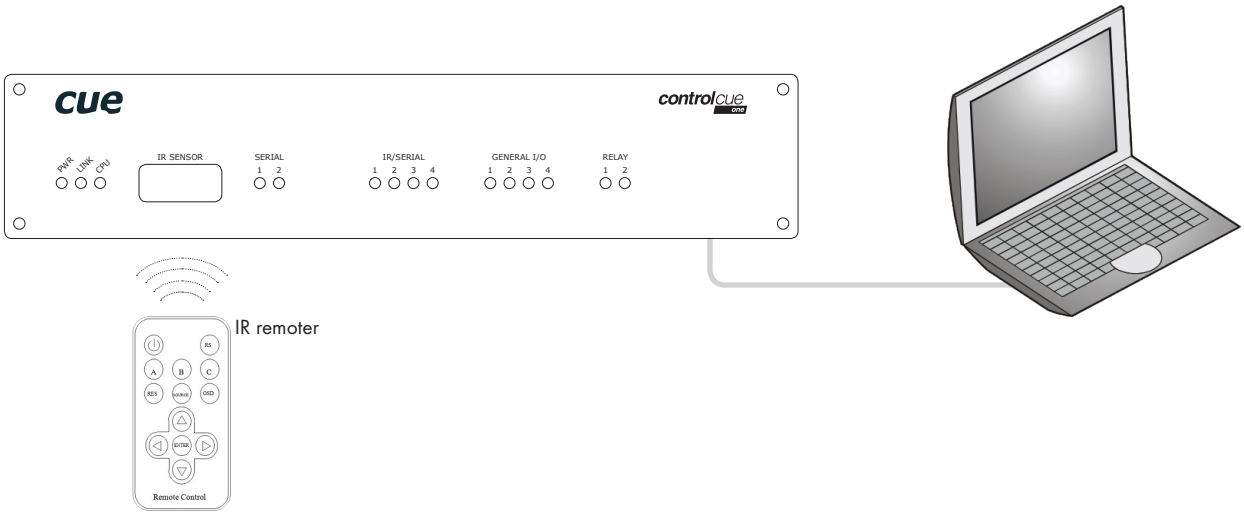
Units equipped with IR capture sensor are

- Wireless touch panel airCUE-7
- Touch panel controllers
- Wired touch panels cuenium[2]
- Controllers ipCUE-alpha, ipCUE-beta, ipCUE-delta, ipCUE-epsilon, ipCUE-sigma
- Controllers controlCUE-one, controlCUE-two, controlCUE-versatile-d

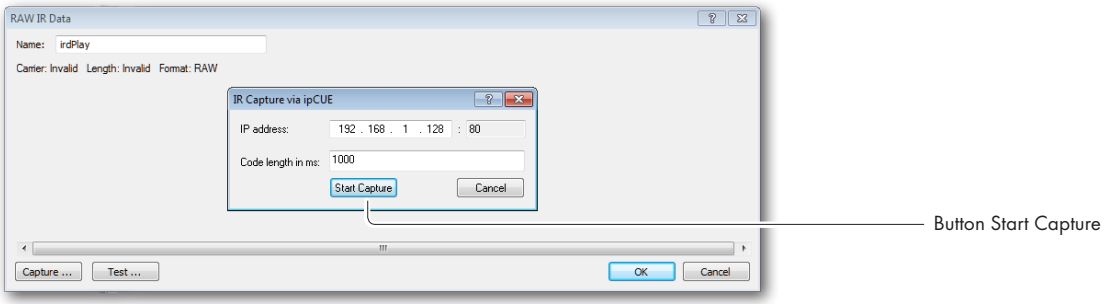
Capture

The capture procedure consists of the following steps:

1. Connect the capture unit and the PC with Cue Visual Composer to the same Network.
2. Arrange the IR remoter and the capture unit as described below.



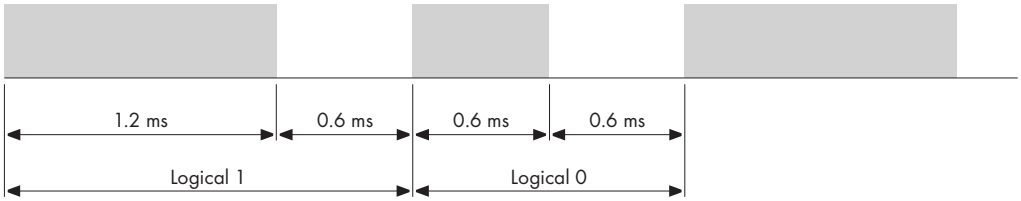
3. Pay attention to set the proper distance between the capturing unit and the remoter according to the needs of the capturing unit.
4. Start Cue Visual Composer and go to the appropriate driver and command.
5. Set the IP address of the unit used for capture.
6. Push the Start Capture button in Cue Visual Composer and then press the appropriate button on the IR remoter.



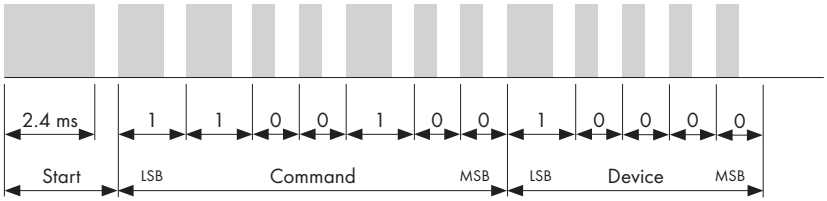
Sony SIRC

Description

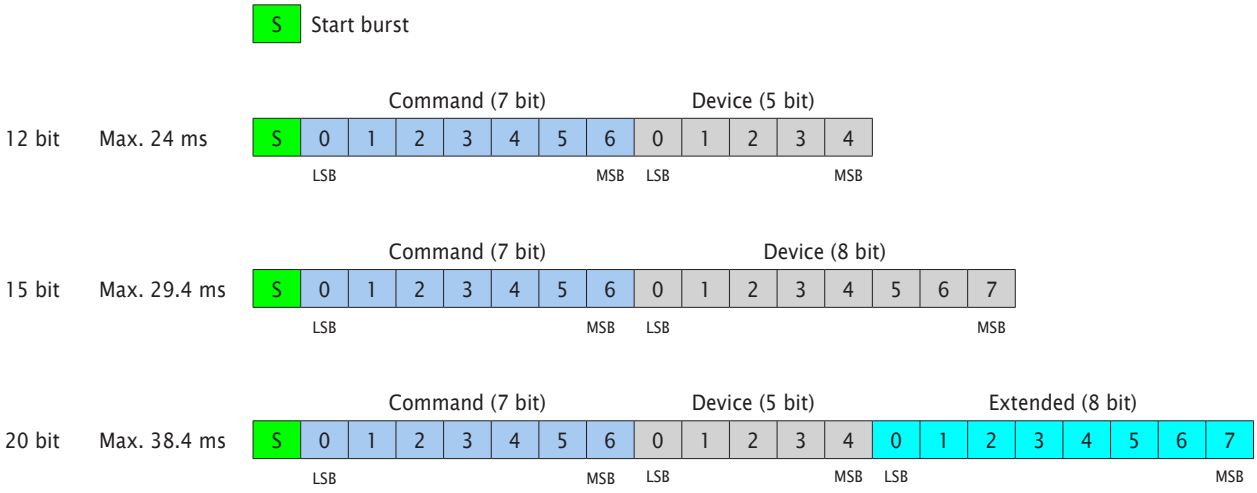
The SIRC (Serial Infra-Red Control) protocol uses a pulse width encoding of the bits. The pulse representing a logical 1 is a 1.2 ms long burst of the 40 kHz carrier, while the burst width for a logical 0 is 0.6 ms long. All bursts are separated by a 0.6 ms long space interval. The recommended carrier duty-cycle is 1/4 or 1/3.



The picture below shows a typical pulse train of the SIRC 12 bit protocol. With this protocol the LSB is transmitted first. The start burst is always 2.4 ms wide, followed by a standard space of 0.6 ms. Apart from signalling the start of a SIRC message this start burst is also used to adjust the gain of the IR receiver. Commands are repeated every 45 ms (measured from start to start) for as long as the key on the remote control is held down.



There are three versions of the protocol – 12, 15 and 20 bit. All three versions have a Command and Device word, the 20 bit version only has an 8 bit Extended word. Within the bit stream each word is sent LSB first as shown below.



Usage in the Cue System

First it is necessary to have the Sony SIRC code description. Typically the description contains

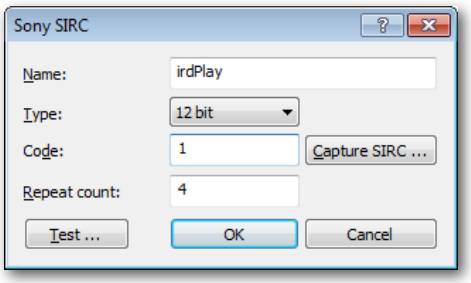
- The device number and the Command number for the 12 bit and the 15 bit version
- The extended number, the Device number and the Command number for the 20 bit version.

The code description can be found here: www.hifi-remote.com/sony/.

For using in Cue Visual Composer, it is necessary to calculate the Code number using formulas described in the following table.

Type	General description	Formula
12 bit	Device.Command	Code = 128 * Device + Command
15 bit	Device.Command	Code = 128 * Device + Command
20 bit	Extended.Device.Command	Code = 4096 * Extended + 128 * Device + Command

Then it is possible to use the Cue Visual Composer dialog to enter the Code.



Examples

Type	Command	Extended[1].Device.Command	Code
12 bit	CD Play	17.50	2226
15 bit	Tuner Preset+	45.16	5776
20 bit	DVD Power On	73.26.46	302382
	DVD Power Off	73.26.47	302383
	DVD Play	73.26.50	302386

[1] The extended number is used for the 20 bit version only.

ProntoEdit HEX Importing

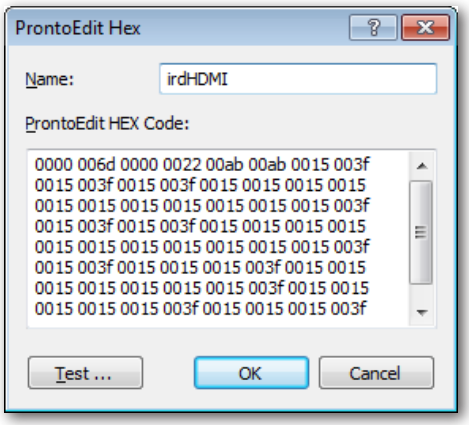
Description

The ProntoEdit HEX format uses a pair of numbers to describe an On and Off sequence of carrier pulses for the IR emitter. The first digit represents the On time and the second the Off time.

An example of the ProntoEdit HEX code:

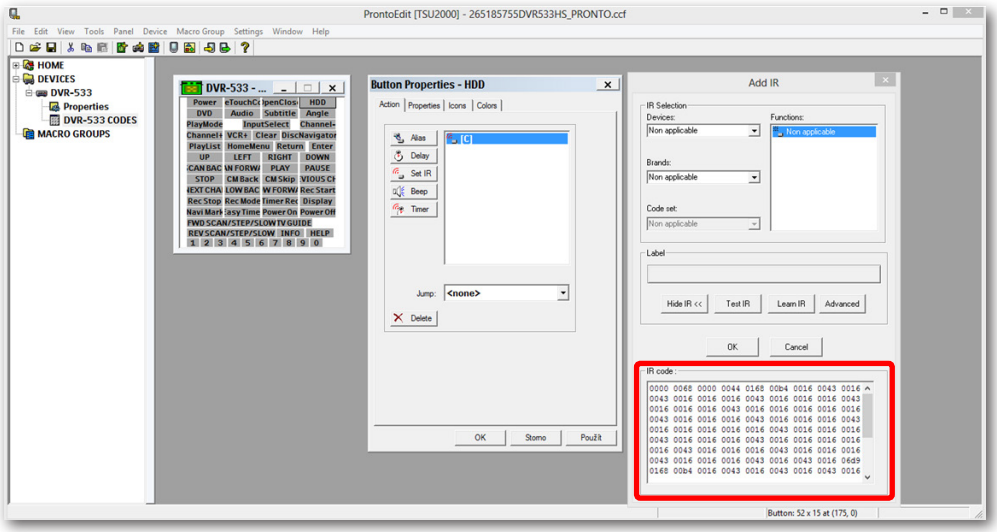
```
0000 006d 0000 0022 00ab 00ab 0015 003f
0015 003f 0015 003f 0015 0015 0015 0015
0015 0015 0015 0015 0015 0015 0015 003f
0015 003f 0015 003f 0015 0015 0015 0015
0015 0015 0015 0015 0015 0015 0015 003f
0015 003f 0015 0015 0015 003f 0015 0015
0015 0015 0015 0015 0015 003f 0015 0015
0015 0015 0015 003f 0015 0015 0015 003f
0015 003f 0015 003f 0015 0015 0015 0715
```

The ProntoEdit HEX code can be inserted (copy and paste) to a driver's IR data using Cue Visual Composer.



CCF Importing

The CFF (Component Configuration File) format can be opened in ProntoEdit software. There you can view each IR code in ProntoEdit HEX format. This format can be copied and pasted to the driver's IR data as described in the previous section.



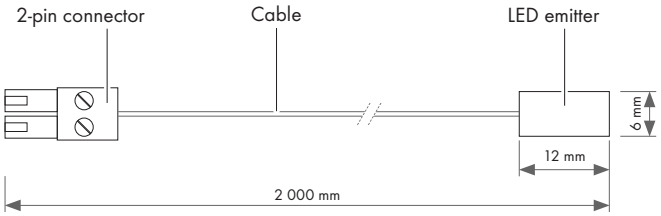
How to Send IR Codes

IR Adapter /i

Overview

The IR Adapter /i is an infrared emitter cable used for controlling AV devices equipped with IR control capabilities. It is compatible with controllers, touch panel controllers and IP interfaces. The cable length is 2 m.

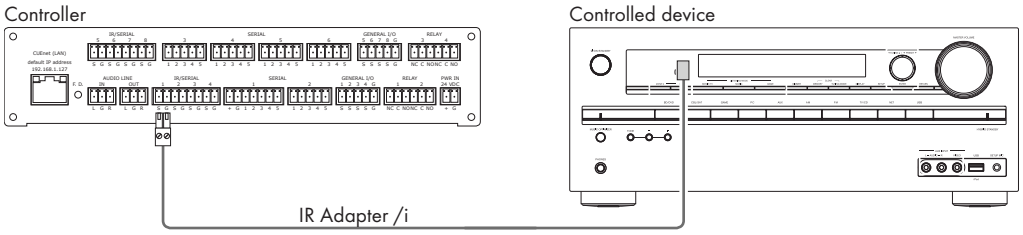
The LED emitter is fastened on the receiver window using a double-sided adhesive tape.



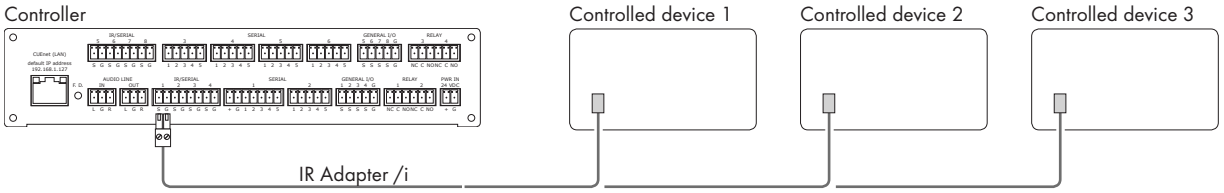
Connection

The IR Adapter /i can be connected to

- IR/Serial output
- Versatile port



Up to three original IR Adapter /i infra-red emitters can be connected to each output in parallel. All emitters send the same IR codes. This configuration can be used for different types of devices.



It is not recommended to connect more infra-red emitters of various manufacturers in parallel because the output can be either overloaded or damaged.

Resources

http://www.cuesystem.com/accessories.aspx

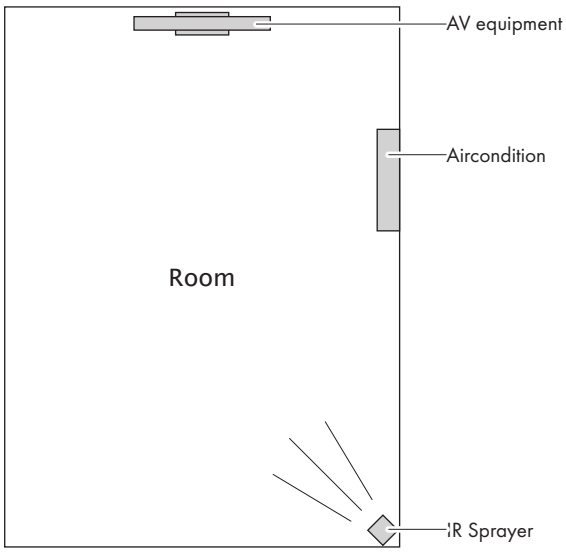
IR Sprayer

Overview

The IR Sprayer amplifies and emits infrared control signal from the IR/Serial output and makes it possible to control multiple IR controllable devices by spraying the area with IR signals. This eliminates the need to attach an IR Adapter /i to each device.

The compact and small black plastic enclosure can be simply fastened on a flat surface using a double-sided adhesive tape. For more flexible installation a Wall-mounted Adapter is available.

Installation



This picture describes an example of how to use the IR Sprayer for AV equipment and air-condition control.

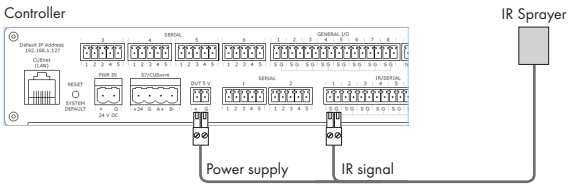
Place the IR Sprayer to the appropriate position in the room. You can use both direct and reflected signals. Functionality depends on the specific conditions in the room, wall material, furniture, etc.

If the devices are not receiving IR signals, reposition the sprayer.

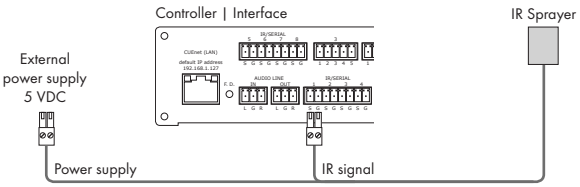
Connection

The IR Sprayer is equipped with a 2 m cable and two 2-pin connectors. The white labelled connector serves for signal connection to the IR/Serial output or to the Versatile port. The red labelled connector is a power supply and it can be connected to the controller power output of 5 VDC. Some controllers and interfaces are not equipped the with output of 5 VDC, in which case external power supply of 5 VDC is required.

Power supply from unit



External power supply



Units equipped with 5 VDC output

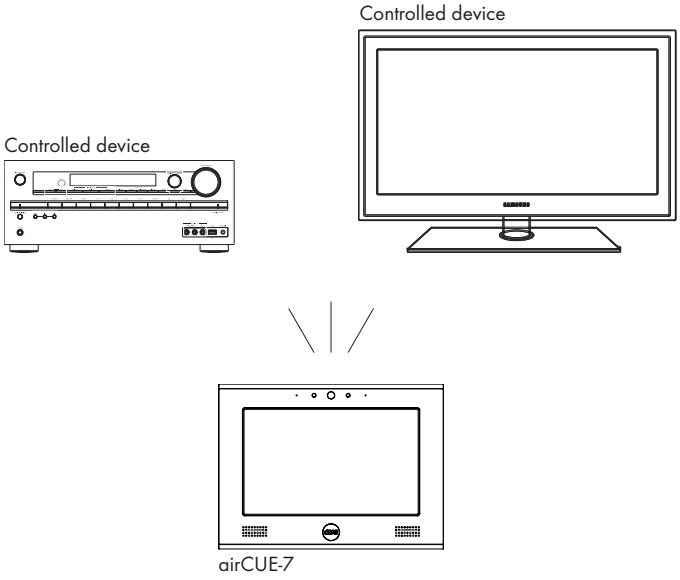
- uniCUE-7, uniCUE-12
- ipCUE-alpha, ipCUE-beta, ipCUE-epsilon, ipCUE-delta, ipCUE-sigma

Resources

http://www.cuesystem.com/accessories.aspx

airCUE-7

The airCUE-7 wireless touch panel is equipped with an IR transmitter and allows to transmit IR codes directly. IR-controlled devices can be controlled without a controller.



Resources

http://www.cuesystem.com/wireless_touch_panels_cuenium2.aspx

Serial Controlled Devices

Introduction

Overview

Many controlled devices support serial control. A serial controlled device receives commands and, in case of bi-directional communication, sends feedback, status data, etc. back to a controller.

Serial control is typical for projectors, TVs, DVD players, media servers, multi-zone audio systems, AV switchers and many other devices.

Serial communication is managed using Cue Visual Composer. Every serial controlled device is described by a serial driver which defines the available functions.

Serial Ports

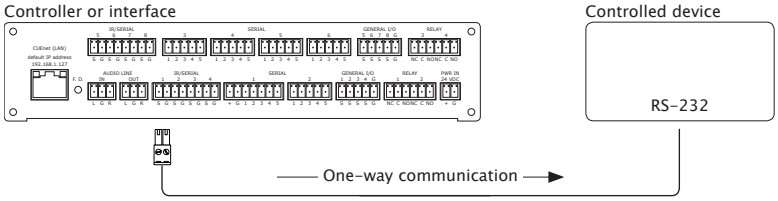
The basic parameters for the most commonly used serial ports are listed in the following table.

Parameter	RS-232	RS-422	RS-485
Mode of operation	Single ended	Differential	Differential
Drivers per line	1	1	32
Receivers per line	1	10	32
Maximum cable length	15 m	1 200 m	1 200 m
Driver output maximum voltage	±25 V	-0.25 to +6 V	-7 to +12 V
Driver output signal level (loaded)	±5 V	±2 V	±1.5 V
Driver output signal level (unloaded)	±15 V	±5 V	±5 V
Driver load impedance	3 kΩ to 7 kΩ	100 kΩ	54 kΩ
Max. driver output current (Power on)	n/a	n/a	±100 mA
Max. driver output current (Power off)	V_{MAX} / 300 Ω	±100 mA	±100 mA
Receiver input voltage range	±15 V	-7 V to +7 V	-7 V to +12 V
Receiver input sensitivity	±3 V	±200 mV	±200 mV
Receiver input resistance	3 kΩ to 7 kΩ	4 kΩ	12 kΩ

Connection

One-Way Control

Controlled devices with the RS-232 channel can be connected to the IR/Serial output or to the Versatile port, which provide one-way communication. That means the device is controlled without the possibility to read any feedback.



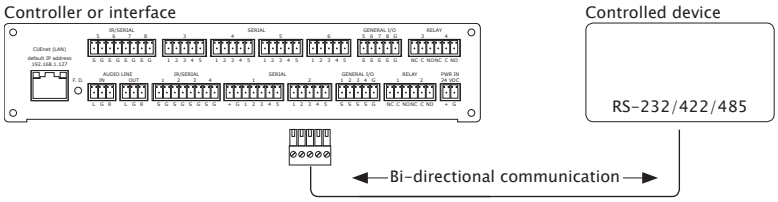
For detail output description see chapters

- System Architecture / Control Ports / IR/Serial Output
- System Architecture / Control Ports / Versatile.

Detailed cable wiring diagrams are available in chapter Wiring Diagrams.

Bi-directional Communication

Bi-directional control is provided by Serial ports. Connector pins can be used for all modes RS-232/422/485. The appropriate mode is selected by the application using XPL[2] API function.



For a detailed serial ports description see the chapter System Architecture / Control Ports / Serial.

Detailed cable wiring diagrams are available in the chapter Wiring Diagrams.

Programming

Overview

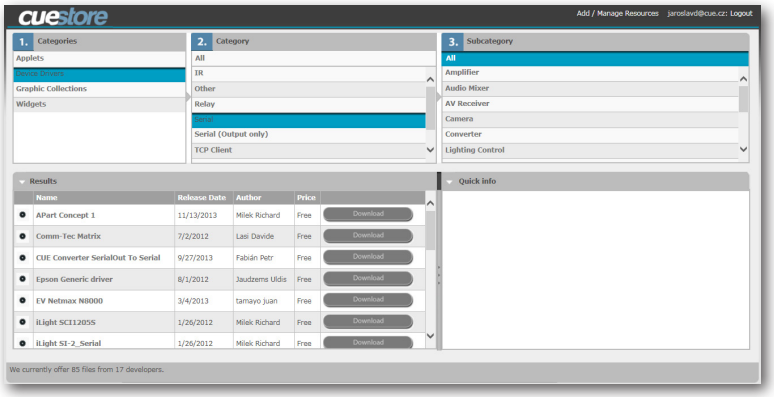
Serial protocols are typically manufacturer's specific protocols for device control. These protocols are implemented through device drivers.

Resources

Ready-to-use drivers are stored in Cue Store. Access to Cue Store is under login.

Go to Cue Store and select

1. Categories - Device Drivers
2. Category - Serial
3. Subcategory - All or appropriate device type
4. Then the appropriate driver can be downloaded and imported to Cue Visual Composer.



In case the driver is not available in Cue Store, it is necessary to create it. Most protocols are public - see the manufacturer's web site for protocol description.

Network Control

Introduction

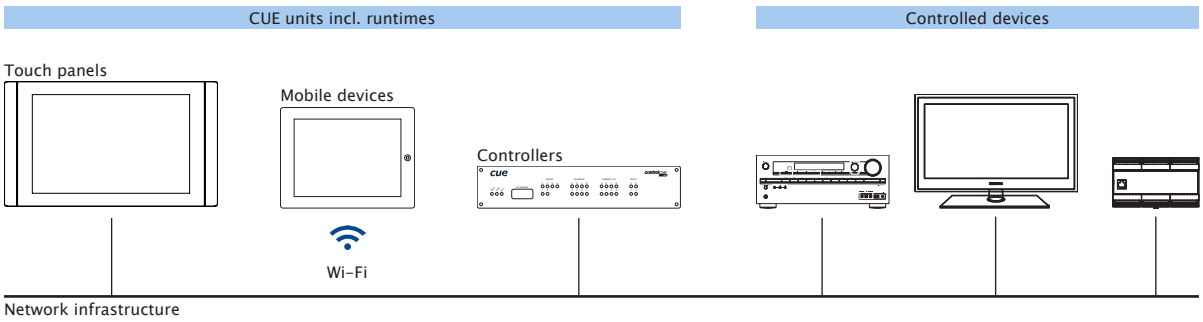
Overview

CUE touch panels, runtimes for mobile devices and controllers are able to control many devices with unmatched support for IP control. Controlling directly via IP requires that CUEunits and controlled devices can communicate over wired or wireless network.

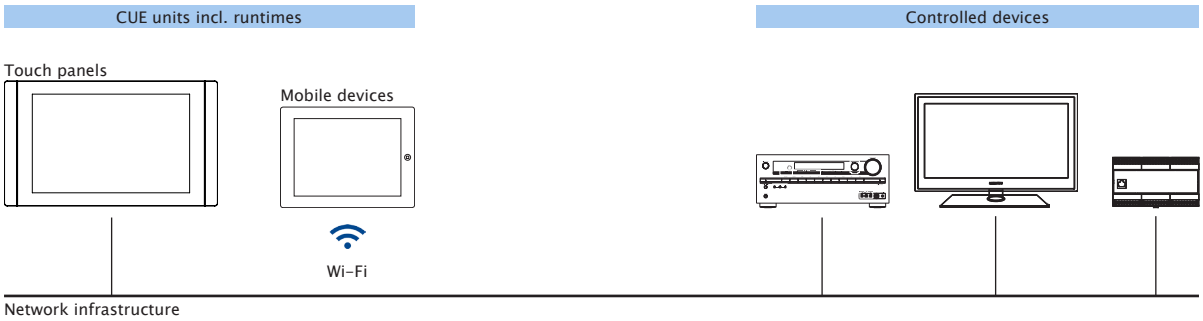
Key advantages of IP control:

- Use of standard wired or wireless network infrastructure.
- Simple and standard cabling.
- No adapters are required.
- The controlled device provides feedback because the IP connection is bi-directional.

Application Diagram



The following diagram describes the use of touch panels and mobile devices with controlled devices only. This configuration allows to create a cost-effective distributed control solution where the touch panel serves as a controller and graphic user interface in one box. In Cue Visual Composer touch panels and controllers are programmed in the same way, which makes it possible to use touch panels as a full-fledged control units.



Note

Standard versions of runtimes for mobile devices do not support IP control.

Layer Model

Overview

The Internet protocol suite is a networking model and a set of communications protocols used for the Internet and similar networks. It is commonly known as TCP/IP, because its most important protocols, the Transmission Control Protocol (TCP) and the Internet Protocol (IP), were the first networking protocols defined in this standard.

TCP/IP provides end-to-end connectivity specifying how data should be formatted, addressed, transmitted, routed and received at the destination. This functionality has been organized into four abstraction layers which are used to sort all related protocols according to the scope of networking involved.

OSI Model Layers	TCP/IP Model Layers	Main Protocols
Application	Application	DNS (Domain Naming System) HTTP (Hypertext Transfer Protocol) Telnet FTP (File Transfer Protocol), TFTP (Trivial File Transfer Protocol) SNMP (Simple Network Management Protocol) SMTP (Simple Mail Transfer Protocol), DHCP (Dynamic Host Configuration Protocol) RDP (Remote Desktop Protocol) RTSP (Real Time Streaming Protocol)
Presentation		
Session Layer		
Transport	Transport	TCP (Transmission Control Protocol) UDP (User Datagram Protocol)
Network	Internet	IP (Internet Protocol) ICMP (Internet Control Message Protocol) ARP (Address Resolution Protocol) RARP (Reverse Address Resolution Protocol) IGMP (Internet Group Management Protocol)
Datalink	Network Access Layer	Ethernet, Token Ring, FDDI, X.25, Frame Relay
Physical		

Application Layer

The application layer is the topmost layer of four layer TCP/IP model. It is present on the top of the Transport layer. The application layer defines TCP/IP application protocols and how host programs interface with the transport layer services to use the network.

Transport layer

The Transport layer is the third layer of the four-layer TCP/IP model. The position of the Transport layer is between the application layer and the Internet layer. The purpose of the Transport layer is to permit devices on the source and destination hosts to carry on a conversation. The Transport layer defines the level of service and the status of the connection used when transporting data.

Internet layer

The Internet Layer is the second layer of the four-layer TCP/IP model. The position of the Internet layer is between the Network Access Layer and the Transport Layer. The Internet layer packs data into data packets known as IP datagrams, which contain source and destination address (logical address or IP address) information that is used to forward the datagrams between hosts and across networks. The Internet layer is also responsible for routing of IP datagrams.

The packet switching network depends upon a connection less internetwork layer. This layer known as the internet layer is the linchpin that holds the whole design together. Its job is to allow hosts to insert packets into any network and have them delivered independently to the destination. At the destination side the data packets may appear in a different order than they were sent. It is the job of the higher layers to rearrange them in order to deliver them to the proper network applications operating at the Application layer.

Network Access Layer

The Network Access Layer is the first layer of the four-layer TCP/IP model. It defines details of how data is physically sent through the network, including how bits are electrically or optically signaled by hardware devices that interface directly with a network medium, such as a coaxial cable, an optical fiber, or a twisted pair copper wire.

Transport Protocols

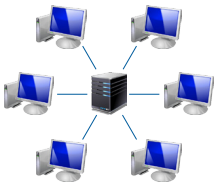
TCP/UDP Client/Server Architecture

Introduction

This chapter describes in general terms the functioning of the client-server model as well as the basic characteristics and comparison of TCP/UDP communication protocols.

Client-Server Model

The client-server model of computing is a distributed software architecture model consisting of two parts, client systems and server systems. Both communicate over a computer network on separate hardware, but both client and server may reside in the same system. A client-server application is a distributed system consisting of both client and server software. A server host runs one or more server programs which share their resources with clients. A client does not share any of its resources, but requests the contents of a server. The client process always initiates a connection to the server, while the server process always waits for requests from any client.



The client-server architecture has become one of the basic models of network computing. Many types of applications have been written using the client-server model. Standard networked functions such as e-mail exchange, web access and database access, are based on the client-server model. For example, a web browser is a client program at the user computer that may access information at any web server in the world.

Client and Server Roles

The client-server characteristics describe the relationship of cooperating software components in an application. The server component provides a function or service to one or many clients, which initiate requests for such services.

A shared resource may be any of the server software and electronic components, from programs and data to local and/or external devices. The sharing of resources of a server constitutes a service.

Whether a unit is a client, a server or both is determined by the nature of the application that requires the service functions. For example, a single hardware can run web server and data server software at the same time to serve different data to clients making different kinds of requests. Client software can also communicate with server software within the same hardware.

Client Characteristics

- Always initiates requests to servers.
- Waits for replies.
- Receives replies.
- Usually interacts directly with end-users using any user interface such as graphical user interface.

Server Characteristics

- Always waits for a request from one of the clients.
- Serves clients requests then replies with requested data to the clients.
- A server is a source which sends requests to client to get the needed data of users.

Client and Server Communication

In general, a service is an abstraction of unit resources and a client does not have to be concerned with how the server performs while fulfilling the request and delivering the response. The client only has to understand the response based on the well-known application protocol, i.e. the content and the formatting of the data for the requested service.

Clients and servers exchange messages in a predefined request-response format. The client sends a request, and the server returns a response. To communicate, both clients and servers must have a common language, and they must follow rules so that both the client and the server know what to expect. The language and rules of communication are defined in a communications protocol. All client-server protocols operate in the application layer. The server may implement an API (such as a web service). The API is an abstraction layer for such resources as databases and custom software. By restricting communication to a specific content format, it facilitates parsing. By abstracting access, it facilitates cross-platform data exchange.

TCP/UDP Protocols

The TCP and UDP protocols are two different protocols that handle data communications between nodes in an IP network (the Internet). This chapter will describe what TCP and UDP are, and explain the differences between them. In the OSI model, TCP and UDP are both “Transport Layer” protocols.

TCP

TCP provides a communication service at an intermediate level between an application program and the Internet Protocol (IP). That means when an application program desires to send a large chunk of data across the Internet using IP, instead of breaking the data into IP-sized pieces and issuing a series of IP requests, the software can issue a single request to TCP and let TCP handle the IP details.

TCP provides reliable, ordered, error-checked delivery of a stream of bytes between programs running on devices connected to a local area network, intranet or the public Internet.

IP works by exchanging pieces of information called packets. A packet is a sequence of bytes and consists of a header followed by a body. The header describes the packet’s source, destination and control information. The body contains the data IP is transmitting.

Due to network overload, traffic load balancing, or other unpredictable network behavior, IP packets can be lost, duplicated, or delivered out of order. TCP detects these problems, requests retransmission of lost data, rearranges out-of-order data, and even helps minimize network load to reduce occurrence of the other problems. Once the TCP receiver has reassembled the sequence of bytes originally transmitted, it passes them to the receiving application. Thus, TCP abstracts the application’s communication from the underlying networking details.

Web browsers use TCP when they connect to servers on the World Wide Web, and they are used to deliver e-mail and transfer files from one location to another.

UDP

The User Datagram Protocol (UDP) is one of the core members of the Internet Protocol (IP) suite (the set of network protocols used for the Internet). With UDP, applications can send messages, in this case referred to as datagrams, to other hosts on an IP network without prior communications to set up special transmission channels or data paths.

UDP uses a connectionless simple transmission model with a minimum of protocol mechanisms. It has no handshaking dialogues, and thus exposes any unreliability of the underlying network protocol to the user’s program. As this is normally IP over unreliable media, there is no guarantee of delivery, ordering, or duplicate protection. UDP provides checksums for data integrity, and port numbers for addressing different functions at the source and destination of the datagram.

UDP is suitable for purposes where error checking and correction is either not necessary or performed in the application, avoiding the overhead of such processing at the network interface level. Time-sensitive applications often use UDP because dropping packets is preferable to waiting for delayed packets.

UDP is faster than TCP because there is no form of flow control. No error checking, error correction or acknowledgment is done by UDP; it is only concerned with speed.

UDP datagram is a sequence of bytes and consists of a header followed by a body. The UDP header consists of 4 fields (Source port, Destination port, Length and Checksum), each of which is 2 bytes (16 bits).

Numerous key Internet applications use UDP, including: the Domain Name System (DNS), where queries must be fast and only consist of a single request followed by a single reply packet, the Simple Network Management Protocol (SNMP), and the Dynamic Host Configuration Protocol (DHCP). Voice and video is generally transmitted using UDP. Real-time video and audio streaming protocols are designed to handle occasional lost packets, so only slight degradation in quality occurs, rather than large delays if lost packets were retransmitted.

Comparison of TCP and UDP

The User Datagram Protocol (UDP) and Transmission Control Protocol (TCP) both reside at the transport layer in the TCP/IP protocol suite. They perform the same role, providing an interface between applications and the data-moving capabilities of the Internet Protocol (IP), but they do it in very different ways. The two protocols thus provide choice to higher-layer protocols, allowing each to select the appropriate one depending on its needs.

Below is the table which helps illustrate the most important basic attributes of both protocols and how they contrast with each other:

Attribute	TCP	UDP
Connection	TCP is a connection-oriented protocol.	UDP is a connectionless protocol.
Function	As a message makes its way across the internet from one device to another. This is connection based.	UDP is also a protocol used in message transport or transfer. This is not connection based which means that one program can send a load of packets to another and that will be the end of the relationship.
Usage	TCP is suited for applications that require high reliability, and transmission time is relatively less critical.	UDP is suitable for applications that need fast, efficient transmission. UDP's stateless nature is also useful for servers that answer small queries from huge numbers of clients.
Examples	HTTP, HTTPS, FTP, SMTP, Telnet	DNS, DHCP, TFTP, SNMP, RIP, VOIP
Ordering of data packets	TCP rearranges data packets in the order specified.	UDP has no inherent order as all packets are independent of each other. If ordering is required, it has to be managed by the application layer.
Speed of transfer	The speed of TCP is slower than UDP.	UDP is faster because there is no error-checking for packets.
Reliability	There is absolute guarantee that the data transferred remains intact and arrives in the same order in which it was sent.	There is no guarantee that the messages or packets sent would reach addressee at all.
Header Size	TCP header size is 20 bytes	UDP Header size is 8 bytes.
Streaming of data	Data is read as a byte stream, no distinguishing indications are transmitted to signal message (segment) boundaries.	Packets are sent individually and checked for integrity only if they arrive. Packets have definite boundaries which are honored upon receipt, meaning a read operation at the receiver socket will yield an entire message as it was originally sent.
Weight	TCP is heavy-weight. TCP requires three packets to set up a socket connection, before any user data can be sent. TCP handles reliability and congestion control.	UDP is lightweight. There is no ordering of messages, no tracking connections, etc. It is a small transport layer designed on top of IP.
Data Flow Control	TCP does Flow Control.	UDP does not have an option for flow control.
Error Checking	TCP does error checking.	UDP does error checking, but no recovery options.
Fields	1. Sequence number, 2. ACK number, 3. Data offset, 4. Reserved, 5. Control bit, 6. Window, 7. Urgent Pointer 8. Options, 9. Padding, 10. Checksum, 11. Source port, 12. Destination port	1. Source port, 2. Destination port, 3. Length, 4. Checksum
Checksum	Checksum	To detect errors only
Acknowledgement	Acknowledgement segments	No Acknowledgment
Handshake	SYN, SYN-ACK, ACK	No handshake (connectionless protocol)

See also

http://en.wikipedia.org/wiki/Client%E2%80%93server_model

http://simple.wikipedia.org/wiki/Client-server

http://www.diffen.com/difference/TCP_vs_UDP

http://en.wikipedia.org/wiki/User_Datagram_Protocol

http://en.wikipedia.org/wiki/Transmission_Control_Protocol

http://en.wikibooks.org/wiki/Communication_Networks/TCP_and_UDP_Protocols

Resources

Appropriate drivers are available in Cue Store.

Standard Application Protocols

Overview

The Cue System supports many open standard communication protocols.

Protocols are implemented as

- Firmware in touch panels, mobile device runtimes and controllers – in this case protocols support API commands (e-mail, video) and they are not available in user application.
- IP drivers – in this case protocols are implemented as IP device drivers and they are available in Cue Store for download and usage in Cue Visual Composer user application.

SMPT (Simple Mail Transfer Protocol)

Overview

Simple Mail Transfer Protocol (SMTP) is an Internet standard for electronic mail (e-mail) transmission across Internet Protocol (IP) networks.

Resources

The SMPT protocol is implemented in controller and touch panel firmware and it allows to sent e-mails from an application. Cue Visual Composer programming language offers API functions for e-mail sending.

For more details see CVC Help / Commands / Email section.

RTSP (Real Time Streaming Protocol)

Overview

The Real Time Streaming Protocol (RTSP) is a network control protocol designed for use in entertainment and communications systems to control streaming media servers. The protocol is used for establishing and controlling media sessions between end points. Clients of media servers issue transport commands, such as play and pause, to facilitate real-time control of playback of media files from the server. The transmission of streaming data itself is not a task of the RTSP protocol.

Resources

The RTSP protocol is implemented in the touch panel firmware and it allows to play streaming audio and video. Cue Visual Composer programming language offers API functions for audio and video playback.

For more details see CVC Help / Commands / Video / Play.

Telnet

Overview

The Telnet is a network client-server protocol used on the Internet or in local area networks to provide a bidirectional interactive text-oriented communication facility using a virtual terminal connection. User data is interspersed in-band with Telnet control information in an 8-bit byte-oriented data connection over the TCP.

For more information see www.telnet.org.

Resources

The driver Telnet_TelnetControl_Tcp_Client is available in Cue Store.

HTTP (HyperText Transfer Protocol)

Overview

The Hypertext Transfer Protocol (HTTP) is an application protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web. Hypertext is structured text that uses logical links (hyperlinks) between nodes containing text. HTTP is the protocol to exchange or transfer hypertext. HTTP functions acts as a request-response protocol in the client-server computing model.

XPL² Commands

HTTP protocol is used in the following XPL² commands

- _Video.Play can play MJPEG from the HTTP stream
- ModifiablePicture.ReadFromFile can read PNG and JPG pictures from the HTTP server.

Methods

The ready-to-use driver provides the following methods

- Get – requests a representation of the specified resource. Requests using Get should only retrieve data and should have no other effect.
- Post – requests that the server accept the entity enclosed in the request as a new subordinate of the web resource identified by the URL. The data posted might be an annotation for existing resources; a message for a bulletin board, news group, mailing list, or comment thread; a block of data that is the result of submitting a web form to a data-handling process; or an item to add to a database.
- PostXML – sends XML data to a server.
- ParseResponse – separates answer data from the HTTP protocol.

Resources

The driver HTTP Get & Post simulation is available in Cue Store. It implements all methods described above.

FTP (File Transfer Protocol)

Overview

The File Transfer Protocol (FTP) is a standard network protocol used to transfer files from one host to another over a TCP based network. FTP is built on a client-server architecture and uses separate control and data connections between the client and the server. FTP users may authenticate themselves using a clear-text sign-in protocol, normally in the form of a username and password, but can connect anonymously if the server is configured to allow it.

The CVC driver implements a standard FTP client for transferring files, browsing directories and information functions.

Resources

The driver is available on request at support@cuesystem.com.

POP3 (Post Office Protocol)

Overview

The POP3 is an application-layer Internet standard protocol used by the local e-mail clients to retrieve e-mails from a remote server over a TCP/IP connection.

Resources

For available resources contact support@cuesystem.com.

BACnet

Overview

The BACnet is a data communication protocol for Building Automation and Control Networks. BACnet applications include HVAC control, fire detection and alarm, lighting control, security, utility company interface, etc. BACnet specifies mainly the most common functions – analog and binary input, output, and values; control loops; schedules, etc., that clearly apply to almost any kind of monitoring or control application.

For more information see www.bacnet.org.

Resources

For available resources contact support@cuesystem.com.

Modbus TCP

For details see chapter Standard Buses / Modbus.

PJLink

Overview

PJLink is a unified standard for operating and controlling data projectors. PJLink enables central control of projectors manufactured by different vendors; the projectors can be operated by a controller. PJLink compliant equipment can be managed and controlled at any time and in any place, regardless of manufacturer.

For more information see pjlink.jbmia.or.jp/english/.

Resources

The driver PJLink_Tcp_Client is available in Cue Store.

Proprietary Application Protocols

Overview

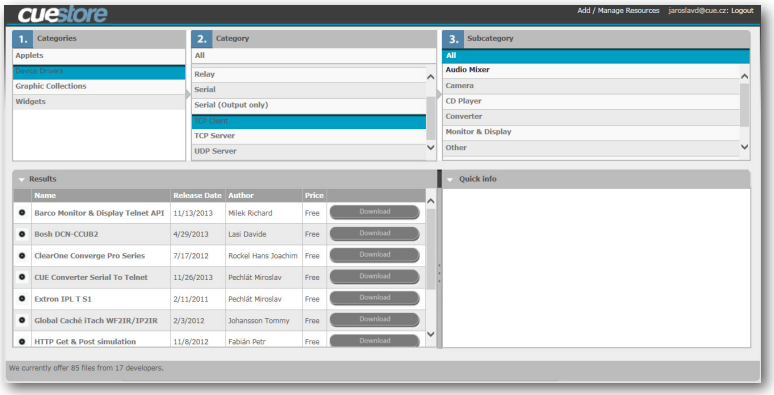
Proprietary application protocols are typically manufacturer's specific protocols for device control. These protocols are implemented through device drivers.

Resources

Ready-to-use drivers are stored in Cue Store. Access to Cue Store is under login.

Go to Cue Store and select

1. Categories – Device Drivers
2. Category – TCP Client / TCP Server / UDP Client / UDP Server
3. Subcategory – All or the appropriate device type
4. Then the appropriate driver can be downloaded and imported to Cue Visual Composer.



In case the driver is not available in Cue Store, it is necessary to create it. Most protocols are public – see the manufacturer's web site for protocol description.

Wake-On-LAN

Description

Wake-on-LAN (WOL) is an Ethernet computer networking standard that allows a computer to be turned on or awakened by a network message. The message is usually sent by a program executed on another computer (controller, touch panel) in the same local area network.

Ethernet connections are based on packets of data sent between computers. Wake-on-LAN is implemented using a specially designed packet called a magic packet, which is sent to the computer to be woken up. The magic packet contains the MAC address of the destination computer, an identifying number built into each network interface card (NIC) or other ethernet device in a computer that enables it to be uniquely recognized and addressed in a network. Powered-down or turned off computers capable of Wake-on-LAN will contain network devices able to listen to incoming packets in low-power mode while the system is powered down. If a magic packet is received that is directed to the device's MAC address, the NIC signals the computer's power supply or motherboard to initiate the system wake-up, much in the same way as pressing the power button would do.

The magic packet is sent on the data link layer (layer 2 in the OSI model) and when sent, it is broadcast to all attached devices on a given network, using the network broadcast address. The IP-address (layer 3 in the OSI model) is not used.

The magic packet is a broadcast frame containing anywhere within its payload 6 bytes of all 255 (FF FF FF FF FF FF in hexadecimal), followed by sixteen repetitions of the target computer's 48-bit MAC address, for a total of 102 bytes.

A standard magic packet has the following basic limitations

- Requires the MAC address of the destination computer (also may require a SecureOn password)
- Does not provide a delivery confirmation
- May not work outside of the local network
- Requires hardware support of Wake-On-LAN on the destination computer
- 802.11 wireless interfaces do not maintain a link in low-power states and cannot receive a magic packet

Resources

Wake-On-LAN is supported in Cue Visual Composer by the appropriate XPL^2 API function. For more information see CVC Help / Commands / Others / WakeOnLAN.

Standard Buses Interfacing

Modbus

Overview

Modbus is a serial communications protocol. Simple and robust, it has since become a de facto standard communication protocol, and it is now amongst the most commonly available means of connecting industrial electronic devices.

Versions of the Modbus protocol exist for serial port (Modbus Serial) and for Ethernet (Modbus TCP) and other networks that support the Internet protocol suite.

For more information see http://www.modbus.org/.

Modbus Serial

The Modbus Serial protocol is a master-slave protocol. A master-slave type system has one node (the master node) that issues explicit commands to one of the slave nodes and processes responses. Slave nodes will not typically transmit data without a request from the master node, and do not communicate with other slaves.

At the physical level, Modbus Serial systems may use different physical interfaces (RS-485, RS-232). TIA/EIA-485 (RS-485) two-wire interface is the most common. As an add-on option, RS485 Four-Wire interface may also be implemented. A TIA/EIA-232-E (RS232) serial interface may also be used as an interface, when only short point-to-point communication is required.

The Modbus Protocol defines two serial transmission modes, Modbus RTU and Modbus ASCII. The mode determines in what format the data is transmitted. Each unit must support RTU, ASCII mode is optional. All units on one bus must work in the same transmission mode.

Modbus TCP

The Modbus TCP is a variant of the Modbus family of simple, vendor-neutral communication protocols intended for supervision and control of automation equipment. Specifically, it covers the use of Modbus messaging in an Intranet or Internet environment using the TCP/IP protocol. The most common use of the protocols at this time include Ethernet attachment of PLC's, I/O modules, and gateways to other simple field buses or I/O networks.

Resources

Modbus drivers allow working with registers. A register is a memory cell which can be 1-bit or 16-bit long. Each register has its own address and can represent some physical input or output of the system.
The following types of registers are available.

Register type	Description
Discrete input	One bit for read only. For example binary input.
Coil	One bit for read and write. For example relay coil used for switching boiler power. It can be controled (write) or the current state can be read.
Input register	One 16-bit register for read only. For example analog input (temperature sensor).
Holding register	One 16-bit register for read and write. For example boiler setpoint temperature, which can be set (write) or read from boiler.

Note: In some implementations two 16-bit registers can be used for storing one value requiring 32-bits, for example the floating point number. Also a lot of implementations use only holding registers (the most universal type) for all data types. In this case, the integer number values 0 and 1 are used for one-bit registeres and writing to registers, which represents read only value, is ignored.

You can integrate a device with the Modbus protocol by working with suitable registers. You can read a register value and display it on touch panels or you can set the required values on touch panels, write them to the register and control device in this way.

Device Drivers

The following XPL[2] device drivers are available in Cue Store:

- ModbusMaster_Serial
- ModbusSlave_Serial
- ModbusTCP_ModbusTCP_Tcp_Client

DALI

Introduction

Overview

The DALI (Digital Addressable Lighting Interface) is a data protocol and transport mechanism that was jointly developed and specified by several manufacturers of lighting equipment. The DALI standard, specified in IEC standard 60929, ensures interchange ability and compatibility of lighting products from different manufacturers. DALI meets the new challenges of lighting control – more flexibility, greater scalability of control and simple faster installation.

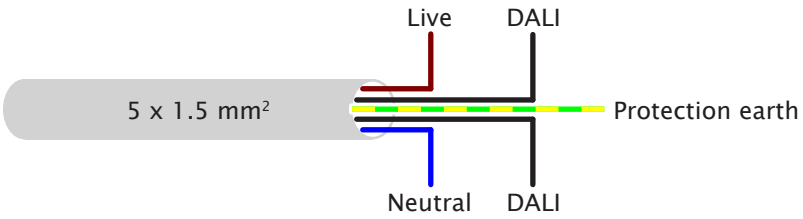
The DALI devices include fluorescent HF ballasts, low-voltage transformers, PE cells, motion detectors, wall switches and gateways to other protocols.

The DALI protocol allows for a maximum of 64 fittings in the single network and the network can be broken up into 16 different possible areas. Sites requiring more than 64 devices are implemented by having multiple separate DALI networks, each with up to 64 devices. These separate networks are then linked together with DALI gateways.

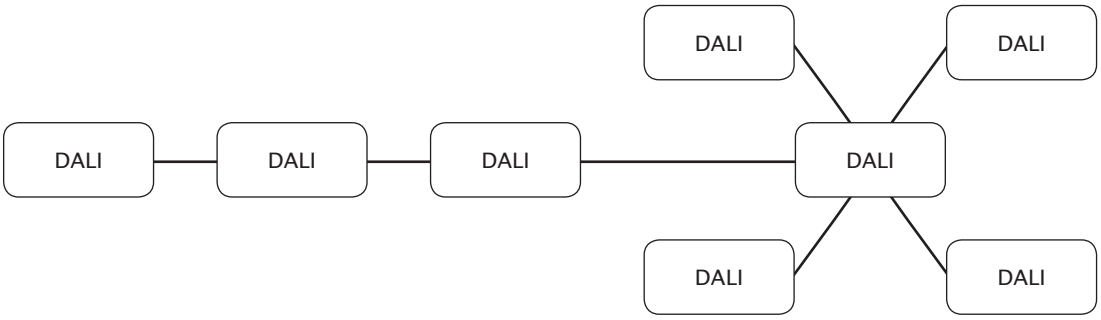
More information about DALI can be found here: http://www.dali-ag.org/.

Why DALI?

- It is standard
- No separate bus line required, it is possible to use additional power wires in a standard power cable
- No need to worry about the mains voltage phase
- No need to worry about polarity
- No wiring by groups
- The DALI control bus may be installed at the same time as the power system.



- There is no requirement for special data cables.
- Power and the DALI lines as well as the associated installation equipment may be installed in parallel in terminal blocks.
- DALI permits a combination of series and star connections.



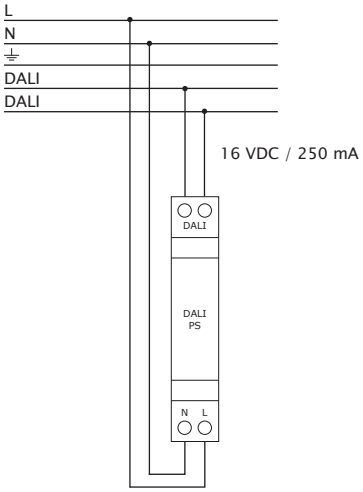
- No termination resistor at the DALI component cable-ends.
- When building occupancy needs change, the DALI system can easily be reconfigured without the need for complex and costly rewiring.

Specifications

Maximum number of devices	64
Number of groups	16
Number of scenes per group	16
Data cable	2 wires
Data encoding method	Manchester
Data baud rate	1 200 baud
Network power supply	9.5 to 22.5 VDC, typically 16 VDC / 250 mA

The physical low-level or active state for DALI has been defined with the interface voltage of < 9.5 V. The high level condition, or DALI idle, is an interface voltage between 9.5 V to 22.5 V, most common being 16 V.

Power Supply



Each component connected to the interface may consume the maximum of 2 mA. Maximum system current is limited to 250 mA.

The controls interface of a DALI ballast normally sources 2 mA, with 64 individual addresses this will source 128 mA. The remaining power can be used to power other DALI controls.

Cables

DALI requires 2 wires to devices, in addition the mains cables if required. These wires are not polarity dependant which makes them simple to install. These wires are at ELV (Extra Low-Voltage) potential and are looped to all devices. Some devices, such as HF ballasts are mains-powered, and only have functional isolation between the mains and the DALI control. This means that even though the DALI control cable operates at ELV potential, it must be treated as if it were at mains potential.

A DALI network requires a 9.5 to 22.4 VDC (typically 16 VDC) power supply to operate. This voltage appears on the data cables and can be used to supply power to peripherals that require it, such as motion detectors. A separate power supply can be used, or some manufacturers have DALI gateways with an integral power supply. When choosing a DALI cable, use a mains-rated cable with conductor sizes as per the chart below.

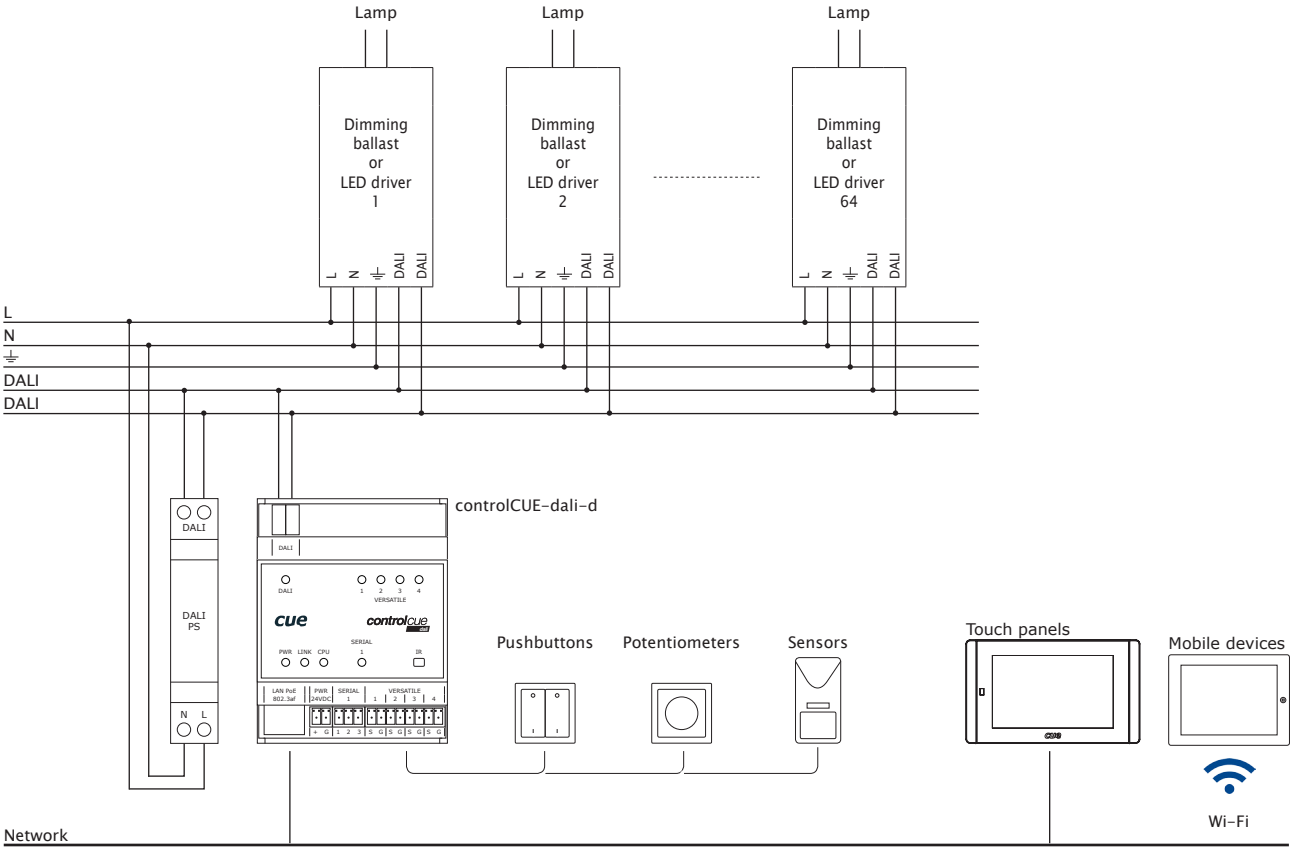
DALI cable length	Minimum DALI cable size
Less than 100 Meters	0.5 mm²
100 to 150 Meters	0.75 mm²
More than 150 Meters	1.5 mm²
More than 300 Meters	Not recommended, avoid runs over 300 meters

The maximum cable length of the DALI signal wires must over 300 m is not recommended. The signal wires voltage drop must not exceed 2 V.

Interfacing

Controller controlCUE-dali-d

DALI is connected to controlCUE-dali-d control port as described below. No need to worry about polarity.



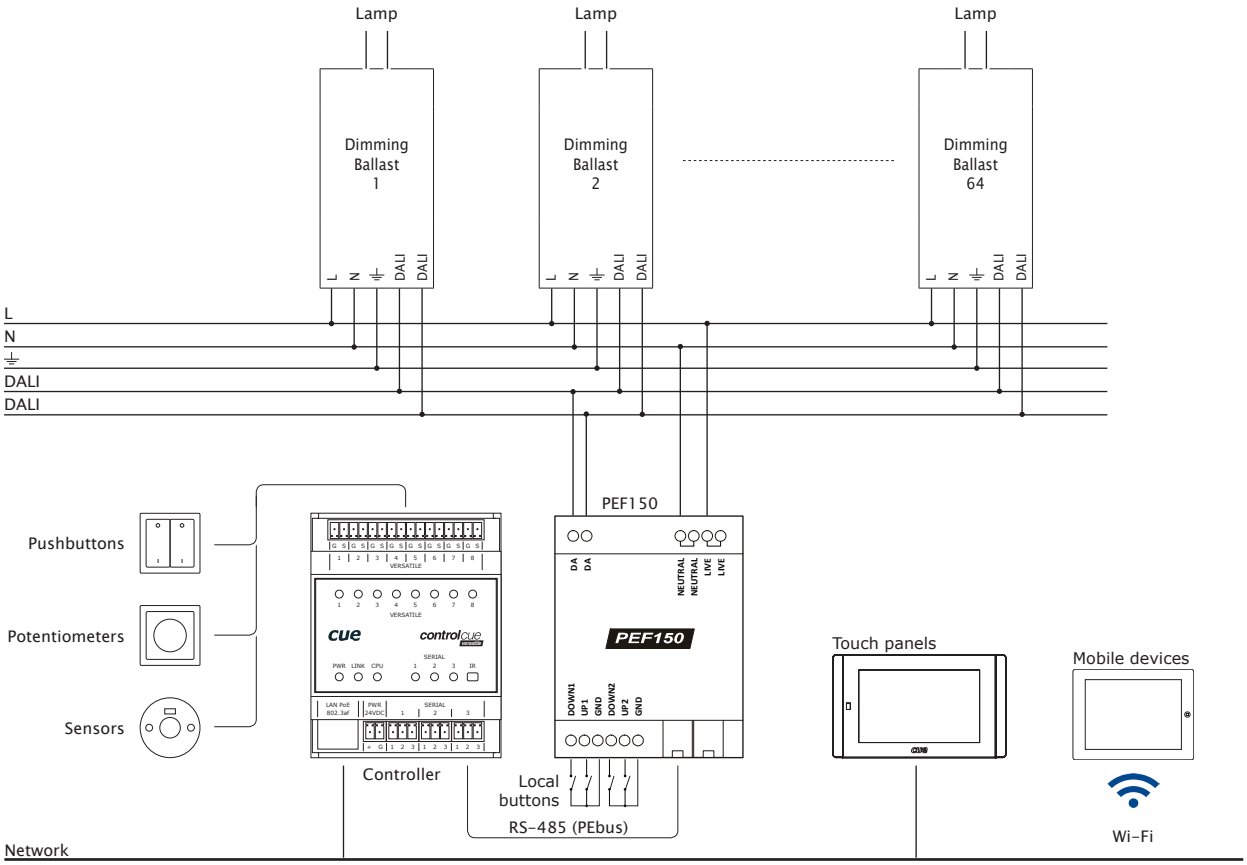
The controlCUE-dali-d is a full-fledged controller and it can be used for complete DALI system control. Up to eight General I/O are available to connect switches, pushbuttons, potentiometers, sensors, etc. All these inputs can control individual DALI circuits, groups or they can activate presets. For more complicated system the touch panel or a mobile device is recommended. Touch panels and mobile devices communicate with controlCUE-dali-d using standard Ethernet or Wi-Fi.

Note

The controlCUE-dali-d controller does not provide DALI power supply. As described in the picture above it is necessary to use external DALI power supply.

Interface PEF150

PEF150 is an interface for controlling up to 64 DALI devices on one bus divided up to 15 independent groups. The unit features the RS-485 PEbus and contact closure control. All groups is possible to control by RS-485 PEbus and two of them by external press buttons. Programmable parameters are inputs response, min. and max. value of output voltage and ramp time.



Note

The PEF150 interface provides DALI power supply and it is not necessary use external DALI power supply. In case you need to use more PEF150 on one DALI bus, or you have another DALI power supply on this bus, it is necessary to disable the power supply function in the configuration of PEF150 so that only one power supply is active.

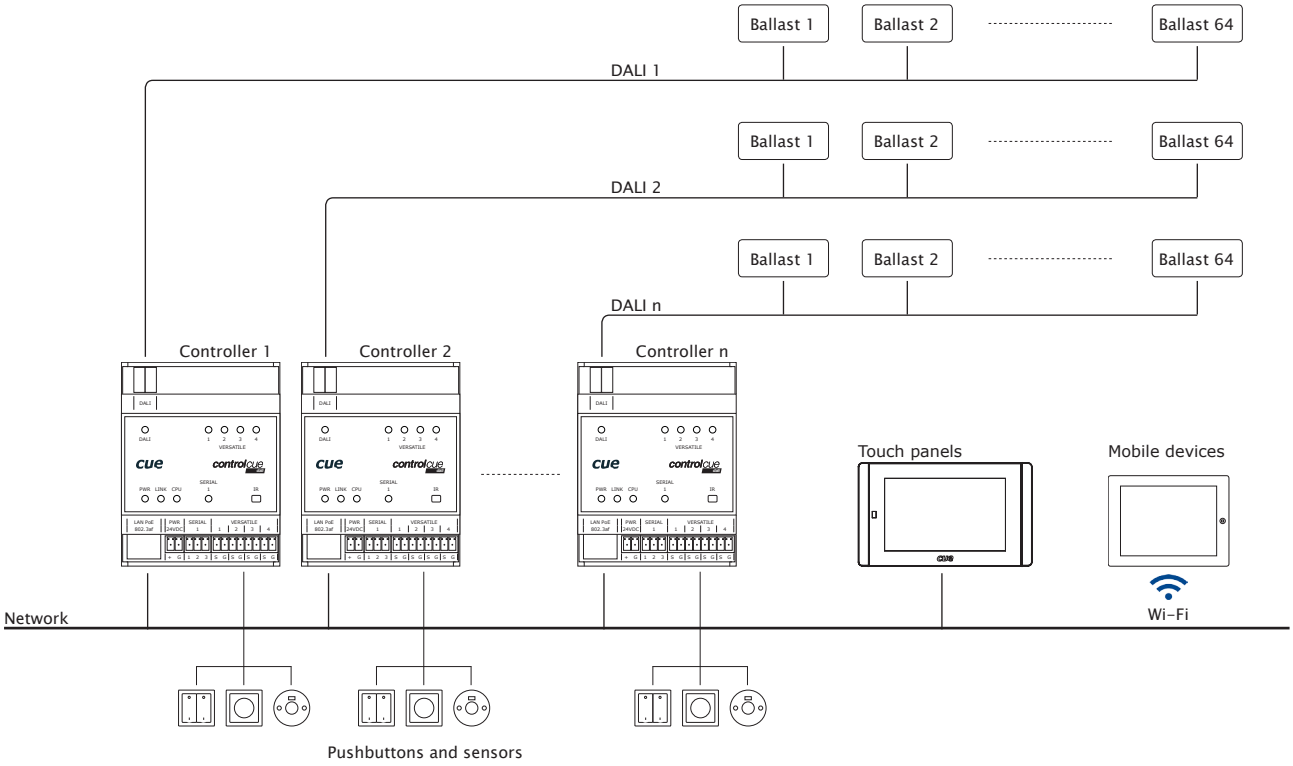
Resources

http://www.cuesystem.com/interfaces.aspx

Multi DALI Systems

Often the project floor layout is not known until the late stages of construction. Electrical installers need to change the DALI bus to match the desired floor plan, ensuring that none of the areas crosses the physical boundary from one DALI network into another.

The Multi DALI System overcomes these restrictions by directly connecting each of the controller in the electrical switchboard via Ethernet. This allows to coordinate multiple DALI networks into one seamless system and automatically manage the logical areas.



Pushbuttons and sensors physically connected to controllers can control devices in all DALI buses. This reduces the number of user interfaces and allows for unlimited area shapes and sizes.

Controllers allow variety of control options – from simple on/off light circuit switching/dimming all the way to sophisticated scenes and presets. Both may be activated manually or scheduled. Touch panels and mobile devices offer unlimited possibilities for creating the graphical user interface.

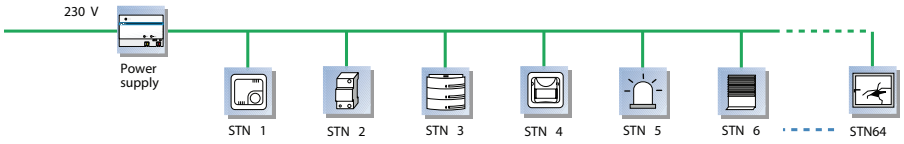
KNX

Introduction

Overview

The KNX works by transmitting and exchanging information along a single common control highway (a bus network) that is compatible with a range of products from different KNX product manufacturers.

The KNX system operates decentrally and does not require a PC or any other special control unit after start-up. The programmed functions are stored in the stations (STN) themselves. Each station can exchange information with any other station by means of telegrams. The lowest configuration level is referred to as a line. A max. of 64 stations can be used in one line or up to 256 stations with the use of repeaters. In larger installations multiple lines are used. The actual number of stations depends on the selected power supply and the power consumption of the individual station.



ETS (Engineering Tool Software)

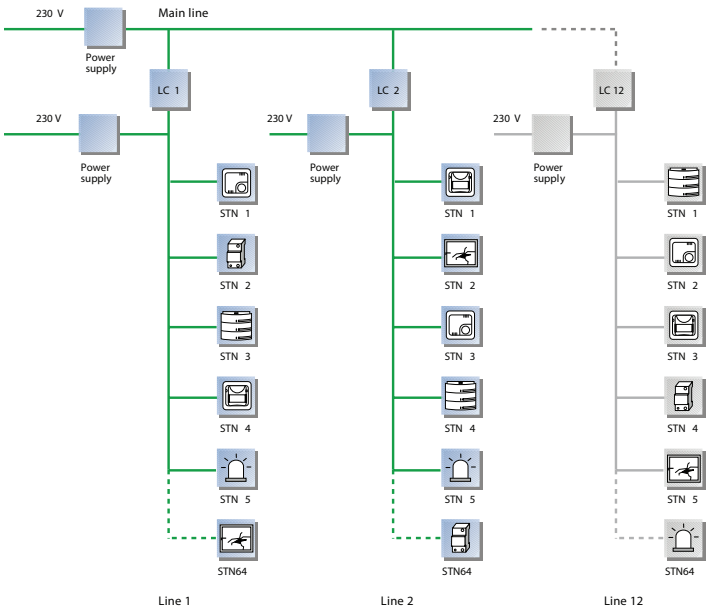
ETS is a software tool for the design and commissioning of the KNX installations. It is a manufacturer-independent configuration software tool to design and configure intelligent home and building control installations with the KNX system. ETS is software running on Windows© platform based computers.

Device Types

There are four types of devices:

- System devices: power supply and USB-interfaces, connectors, choke, line couplers and area couplers
- Sensors: pushbuttons, transducers (wind, rain, light, heat, etc.), thermostats, analogue inputs
- Actuators: switching and dimming actuators, actuators for blinds, heating actuators
- Controllers: sensors and actuators can be logically connected together by means of controllers (logic unit, logic module or similar) for more complex functions.

Several Lines



Two stations can collaborate with a power supply via the bus line in the smallest configuration. The installation bus progressively adapts itself to the size of the system and the required functions and can be extended to more than 57 000 stations.

If there are more than 64 stations or several parts of the building are involved, resulting in the necessity to bring in at least a second line, the lines are connected together by means of a line coupler (LC). The so-called main line, which also requires a power supply, forms the backbone of the line couplers. A main line is topologically structured like a line, with the only difference that in a main line there are no sensors and actuators, but only a line coupler.

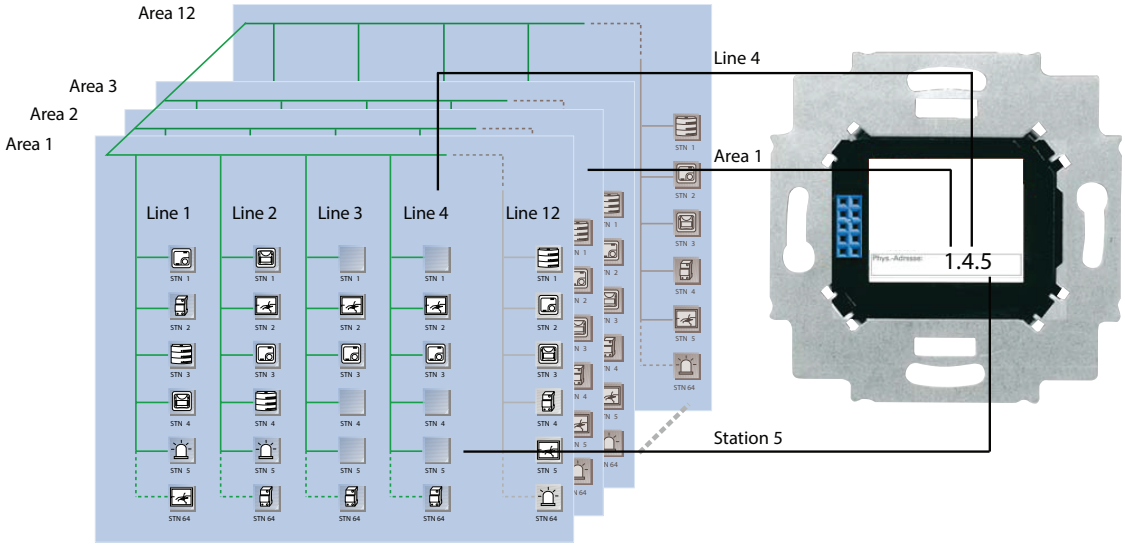
Addressing

Physical Address

The physical address resembles a telephone number for each individual participant. Thus, each physical address only occurs once in an KNX project. From the physical address it is also possible to determine the line that the station can be found in.

The setup of the physical address is always the same, for example 1.4.5, where

- 1 = Area
- 4 = Line
- 5 = Station.



Group Address

The group address is a numbering of the individual functions. A group address occurs at least twice in one project – once with the sensor and once with the actuator. Since the same group address is allocated to the sensor and the actuator, they are functionally linked together. The group address sent from the sensor is registered by the actuator and the respective switching process is carried out.

The division into the main and the station group has become routine. From the ETS 2 onwards a second form of addressing exists on 3 levels: Main group / Middle group / Subgroup.

The setup of the group address is always the same, for example 5/8/10, where

- 5 = Main group
- 8 = Middle group
- 10 = Subgroup.

Irrespective of the address form, up to 32 768 different group addresses can be assigned in one project.

Resources

KNX is a standardized (EN 50090, ISO/IEC 14543), Open Systems Interconnection based network communications protocol for intelligent buildings.

The KNX standard is administered by the KNX Association – http://www.knx.org/.

To start work with KNX, it is recommended to read a document from the EIBA Handbook Series, Volume 1, Primer called Introduction to the system.

Interfacing

Overview

Typically, KNX devices are installed and set up by a company certified by the KNX association. To integrate the Cue System with the KNX network it is necessary to ask for KNX system configuration.

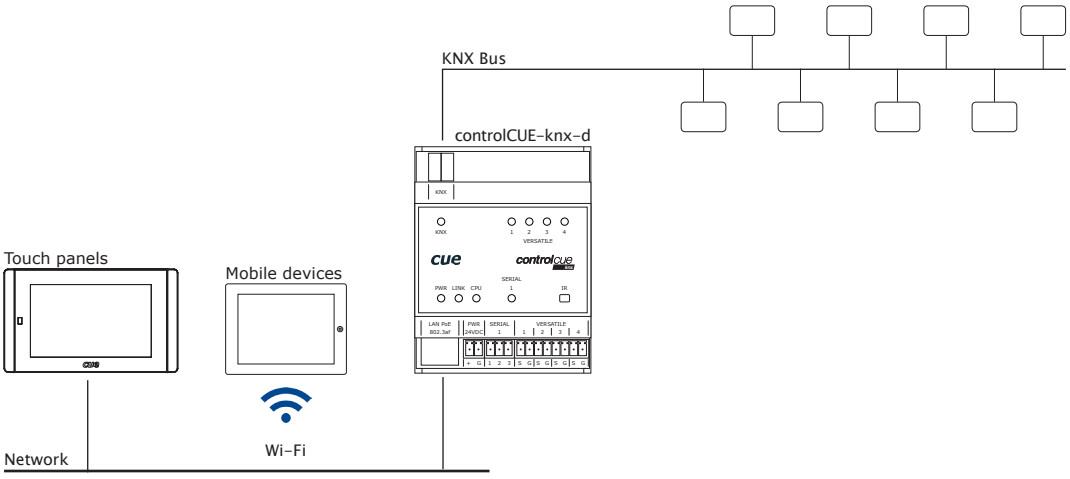
The topology for KNX installations can widely differ from one installation to another. It is very important to take care of the following points:

1. The topology of KNX can consist of some active routing elements like bus couplers, repeaters.. etc. For the proper functioning it is necessary to place the gateway into the right position in KNX bus structure where proper routing of communication can assure that all the commands sent by the gateway can reach the destination devices and that the gateway can hear the telegram for some Group address if the gateway should also receive such telegrams.
2. For the proper programming you need to know all the Group addresses of the KNX devices which you are about to control including their KNX data types. The same you need to know for Group address telegrams you wish to receive. Simply said, you must know the full KNX configuration in order to integrate the Cue System and KNX.

controlCUE-knx-d

The controlCUE-knx-d enables access to the KNX bus using Ethernet. The controller has a built-in BCU (bus coupling unit) which supervises the correct access to the KNX bus. The KNX telegrams can be both sent to and received from the KNX bus.

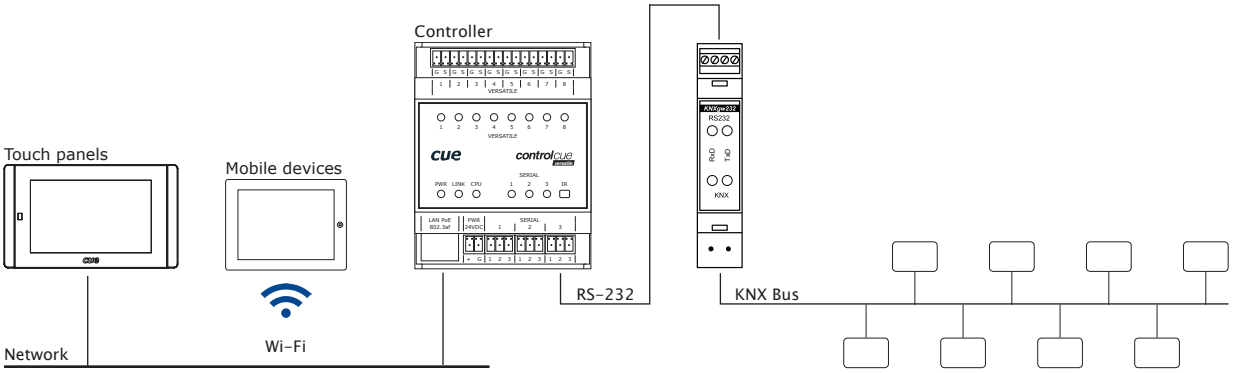
The controlCUE-knx is a full-fledged IP controller with the KNX port and general inputs. Fully compatible with CUE touch panels, this controller provides bi-directional connection between the Cue System and the KNX network and it can work as a stand-alone device. The KNX port is galvanically isolated and is capable of addressing and controlling up to 250 KNX objects. No polling is necessary because the unit is capable of sending live updates.



KNXgw232

KNXgw232 is a gateway which allows access to the KNX using RS-232 serial port. The gateway has a built-in BCU (bus coupling unit) which supervises the correct access to the KNX bus. The KNX telegrams can be both sent to and received from the KNX bus.

The KNX telegrams on the bus-line can be received by the gateway. The gateway filters the desired information and transfers it to the connected controller in ASCII format. As the gateway receives all group telegrams, these Group addresses are filtered with the help of gateway internal settings. In the opposite direction the connected controller transmits the KNX addresses and the allocated information in ASCII format to the gateway. Within the gateway this information is checked concerning validity, and it is transformed into KNX bus.



Using Cue Visual Composer driver KNXgw232 version 2.00 and higher allows to make all needed configuration directly in Cue Visual Composer. No other service utility is needed to accomplish this configuration. The XPL[2] device driver KNXgw232 allows for easy use of KNX communication functions through user-friendly API functions without the necessity to know the ASCII communication protocol mentioned above.

Resources

http://www.cuesystem.com/interfaces.aspx#

DMX512

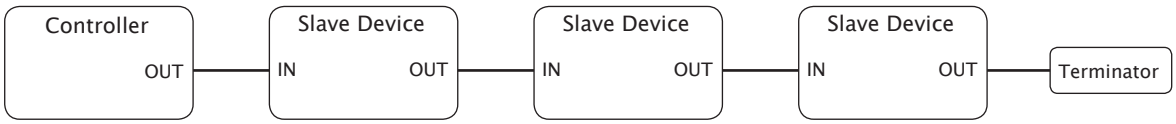
Introduction

DMX512 (Digital MultipleX) is a standard for digital communication networks that are commonly used to control stage lighting and effects as well as interior and architectural lighting. DMX512 is now well established as a professional light management system protocol for dynamic RGB colored and tunable white lighting applications. In view of its versatility it is now also being used for a wide range of other lighting applications. It is the primary method for linking controllers (such as a lighting console) to dimmers and special effects devices such as fog machines and intelligent lights.

Topology

DMX512 employs EIA-485 differential signalling at its physical layer, in conjunction with a variable-size, packet-based communication protocol. It is unidirectional.

The DMX512 network employs a multi-drop bus topology with nodes strung together in what is commonly called a daisy chain. A network consists of a single DMX512 controller (master of the network) and one or more slave devices.



Each slave device has a IN connector and usually an OUT (or THRU) connector as well. The controller, which has only an OUT connector, is connected via a DMX512 cable to the IN connector of the first slave. A second cable then links the OUT connector of the first slave to the IN connector of the next slave in the chain.

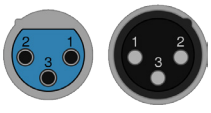
The specification requires a terminator to be connected to the final OUT connector of the last slave on the daisy chain, which would otherwise be unconnected. A terminator is a stand-alone male connector with an integral 120 Ω resistor connected across the primary data signal pair. Some DMX slave devices have built-in terminators that can be manually activated with a mechanical switch or by software, or by automatically sensing the absence of a connected cable.

Connectors

DMX512 1998 specifies that where connectors are used, the data link shall use five-pin XLR style electrical connectors (XLR-5), with female connectors used on transmitting OUT ports and male connectors on receiving ports. The use of a 3-pin XLR connector is specifically prohibited but in practice you can see the use of these standard audio connectors.

DMX512-A (ANSI E1.11-2008) allows the use of eight-pin modular (8P8C, or RJ-45) connectors for fixed installations where regular plugging and unplugging of equipment is not required.

Connector pin-out

Pin	XLR-3	XLR-5	RJ-45
			
1	Signal Common	Signal Common	Data 1+
2	Data 1- (Primary Data Link)	Data 1- (Primary Data Link)	Data 1-
3	Data 1+ (Primary Data Link)	Data 1+ (Primary Data Link)	Data 2+
4		Data 2- (Optional Secondary Data Link)	Not Assigned
5		Data 2+ (Optional Secondary Data Link)	Not Assigned
6			Data 2-
7			Signal Common (0 V) for Data 1
8			Signal Common (0 V) for Data 2

Cabling

The standard cables used in DMX512 networks employ XLR5 connectors, with a male connector on one end and a female connector on the other end. The cable's male connector attaches to the transmitting, female jack OUT, and its female connector attaches to the receiving, male jack IN.

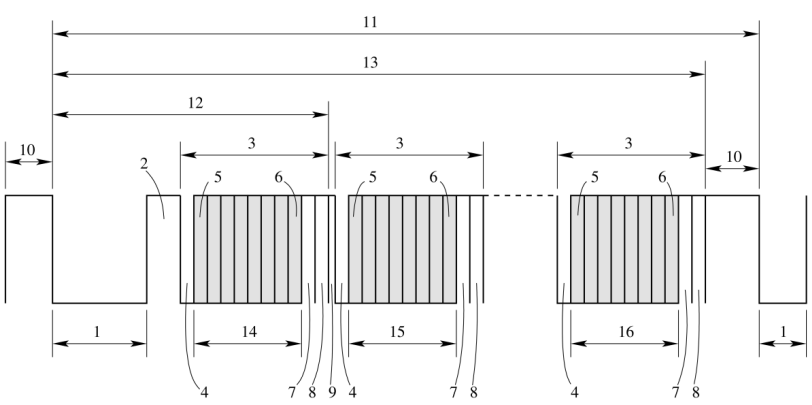
Cabling for DMX512 was removed from the standard and a separate cabling standards project was started in 2003. Two cabling standards have been developed, one for portable DMX512 cables (ANSI E1.27-1 - 2006) and one for permanent installations (BSR E1.27-2).

The electrical characteristics of the DMX512 cable are specified in terms of impedance and capacitance. Cable types that are appropriate for DMX512 usage will have a nominal characteristic impedance of 120 Ω. The Cat5 cable, commonly used for networking and telecommunications, has been tested by ESTA for use with DMX512A. Also, cables designed for EIA485 typically meet the DMX512 electrical specifications. Conversely, microphone and line level audio cables lack the requisite electrical characteristics and thus are not suitable for DMX512 cabling. The significantly lower impedance and higher capacitance of these cables distort the DMX512 digital waveforms, which in turn can cause irregular operation or intermittent errors that are difficult to identify and correct.

Protocol

The protocol is very straightforward. It is repeatedly sending a block of 512 bytes over a serial RS-485 line. These 512 bytes represent 512 different dimmer or parameter values.

The basic DMX512 signal is a 250 kbps serial signal, eight bits data, one start bit, two stop bits, and a frame start break travelling on the RS-485 standard. A frame contains 513 bytes, the first byte was intended to contain a device number, which was never defined as anything but 0, the remaining 512 are the values each device is supposed to receive.



1. SPACE for BREAK
2. MARK after BREAK (MAB)
3. Slot Time
4. START bit
5. LEAST SIGNIFICANT Data BIT (LSB)
6. MOST SIGNIFICANT Data BIT (MSB)
7. STOP Bit
8. STOP bit
9. MARK time between slots
10. MARK before BREAK (MBB)
11. BREAK to BREAK time
12. RESET Sequence (BREAK, MAB, START Code)
13. DMX512 Packet
14. START CODE (SLOT 0 Data)
15. SLOT 1 Data
16. SLOT n DATA (Max. 512)

Device 1 will only use the second byte of each frame, device n will use the $(n+1)^{th}$ byte of the frame, etc. This enables each light to be updated some 40+ times each second.

There is no checksum or error correction of any kind. You may note that for lighting this is ok, if a light has been getting 0 for the last few seconds, and suddenly gets a 128 due to noise, it does not have time to change brightness noticeably before the next value comes. Therefore it is to be used only for non-critical systems (i.e., no flash pots, props or other dangerous equipment). There is only one signal source, though there are devices available to modify the level of some specific channel.

DMX over Ethernet

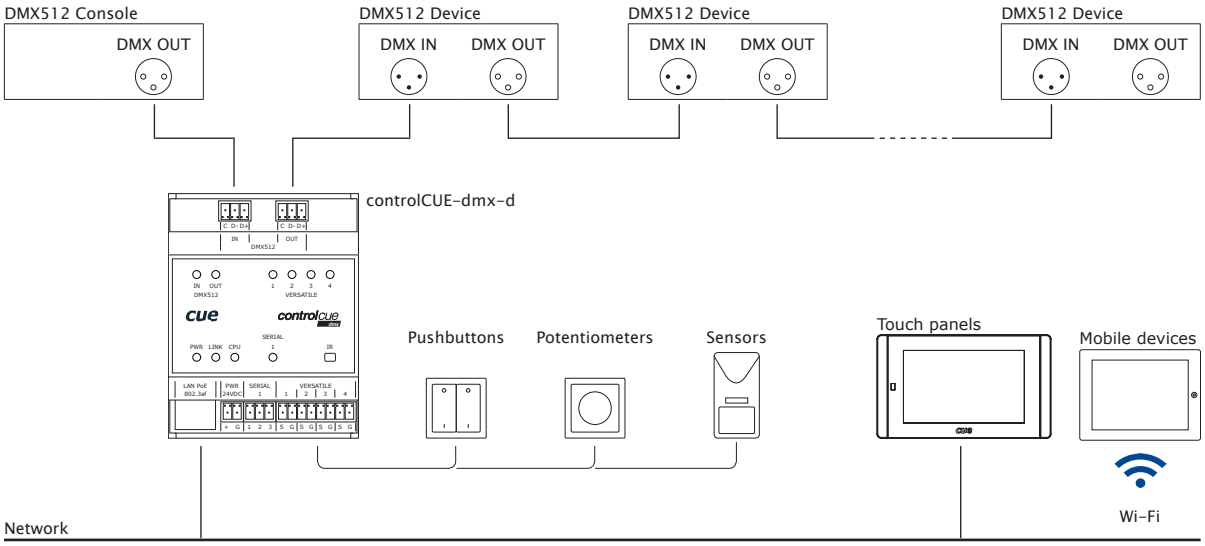
Since Ethernet has a number of advantages over the standard serial DMX, such as multiple universes over one cable and better error detection, most lighting manufacturers offer DMX over Ethernet. The major disadvantage is that the equipment of manufacturer A cannot talk to the equipment of manufacturer B, since there is no standard way of transporting DMX over Ethernet.

The only manufacturers that made their protocols public are Artistic License (Art-Net) and ENTTEC.

Interfacing

controlCUE-dmx-d

DMX512 is connected to controlCUE-dmx-d control port as described below.



The controller controlCUE-dmx-d can work in three basic modes.

1. The controller is the master control unit of the DMX512 bus. Only the DMX output of the controller is functional in this mode.
2. This mode is useful if there is some master controller of DMX512 bus, for example a stage console. In this mode it is possible to use the controller to read the levels of particular channels pushed from the DMX512 control console to the DMX input of the controller, change it and send the new values to the lights.
3. This mode can be used in the same hardware configuration as in Mode 2, but in this case the controller only re-sends commands from the master DMX console unchanged to DMX output.

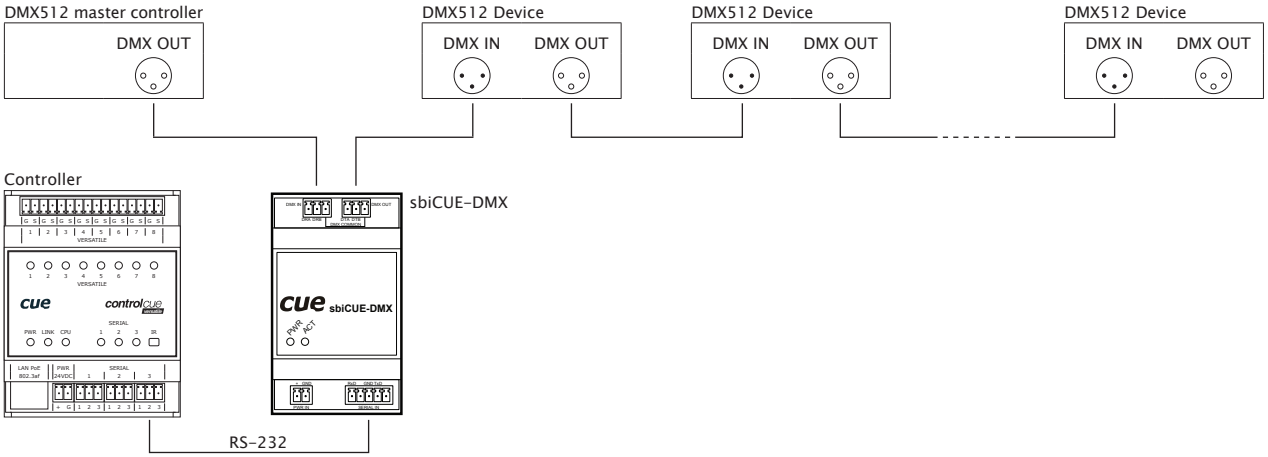
The controlCUE-dmx-d is a full-fledged controller and it can be used for complete DMX512 system control. Up to eight General I/O are available to connect switches, pushbuttons, potentiometers, sensors, etc. All these inputs may control individual DMX512 channels or they may activate presets. For more complicated system the touch panel or a mobile device is recommended. Touch panels and mobile devices communicate with controlCUE-dali-d using standard Ethernet or Wi-Fi.

Resources

http://www.cuesystem.com/ipcue_controllers.aspx

sbiCUE-DMX

sbiCUE-DMX is a converter between the standard RS-232 port and DMX512 bus, which means it is not an equipment connected to any Cue System bus such as CUEring or CUEwire.



sbiCUE-DMX can work in three basic modes.

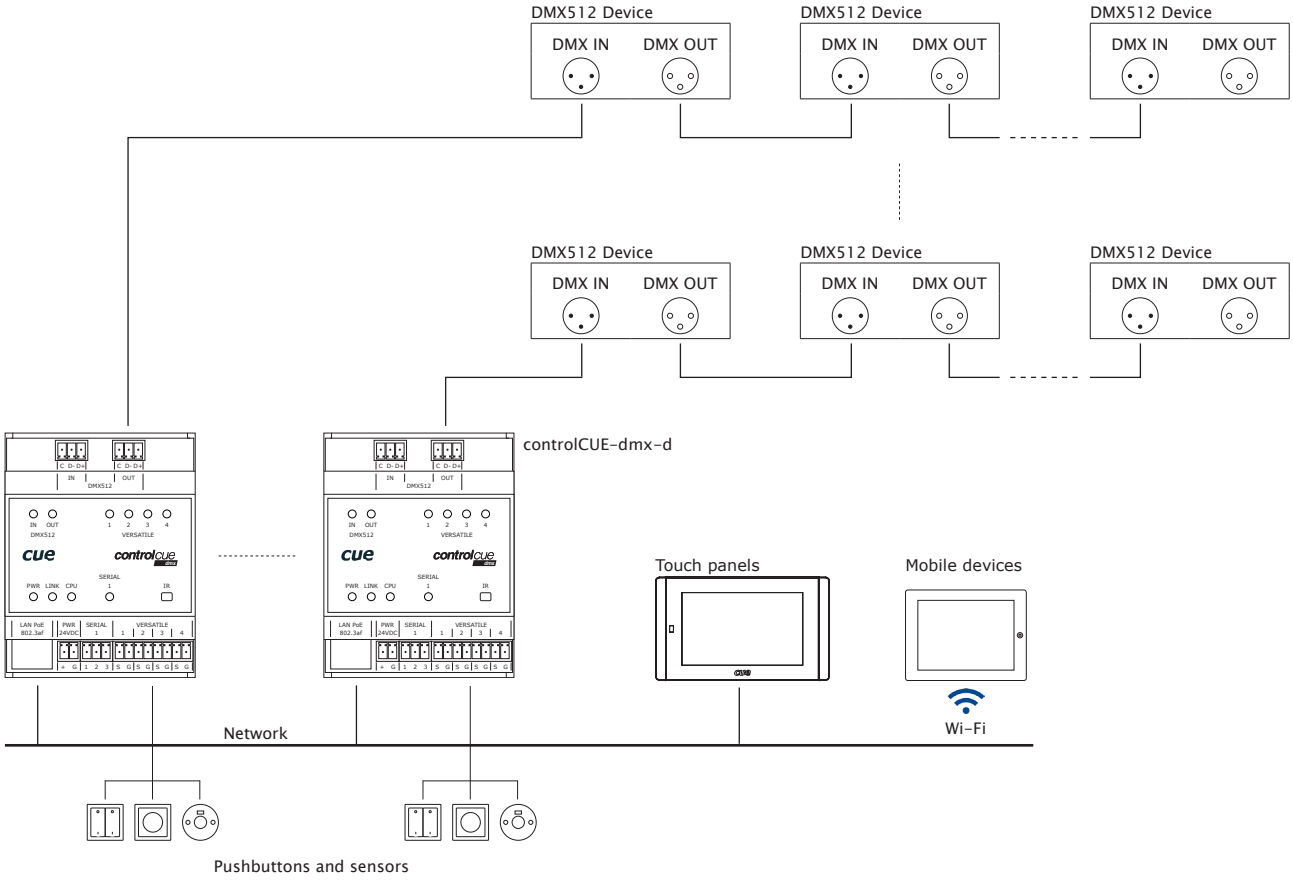
1. sbiCUE-DMX is the master control unit of the DMX512 bus. Only the DMX output of sbiCUE-DMX is functional in this mode.
2. This mode is useful if there is some master controller of the DMX512 bus, for example a stage console. In this mode it is possible to use the CUE controller to read the levels of particular channels pushed from the DMX512 control console to the DMX input of sbiCUE-DMX, change it and send the new values to the lights.
3. This mode can be used in the same hardware configuration as in Mode 2, but in this case sbiCUE-DMX only re-sends commands from the master DMX console unchanged to DMX output. This mode you can use as a “switch off” command of sbiCUE-DMX.

Resources

http://www.cuesystem.com/interfaces.aspx

Multi DMX512 Systems

When more DMX512 are used, the Multi DMX512 System allows to coordinate multiple DMX512 networks into one seamless system and automatically manage the logical areas. Each DMX512 channel is connected to the controller as described in the following picture. Controllers communicate through Ethernet.



Pushbuttons and sensors physically connected to controllers can control devices in all DMX buses. This reduces the number of user interfaces and allows for unlimited area shapes and sizes.

Controllers allows a variety of control options – from simple on light circuit switching / dimming up to sophisticated scenes and presets. Both may be activated manually or scheduled. Touch panels and mobile devices offer unlimited possibilities for creating the graphical user interface.

MIDI

Introduction

Overview

MIDI (Musical Instrument Digital Interface) is an electronic musical instrument industry specification that enables a wide variety of digital musical instruments, computers and other related devices to connect and communicate with one another.

All official MIDI standards are jointly developed and published by

- MIDI Manufacturers Association (MMA) in Los Angeles, California, USA (http://www.midi.org)
- MIDI Committee of the Association of Musical Electronic Industry (AMEI) in Tokyo (http://www.amei.or.jp).

The primary reference for MIDI is The Complete MIDI 1.0 Detailed Specification, document version 96.1, available only directly from MMA in English, or from AMEI in Japan.

The primary functions of MIDI include communicating event messages about musical notation, pitch, velocity, control signals for parameters such as volume, vibrato, audio panning, cues, and clock signals between multiple devices. For users, MIDI enables a single player to sound as though they are playing two or more instruments simultaneously. As an electronic protocol, it is notable for its widespread adoption throughout the music industry.

MIDI is also used as a control protocol in applications other than music, including show control, theatre lighting, special effects, etc. The MIDI Show Control (MSC) protocol (in the Real Time System Exclusive subset) is an industry standard ratified by the MIDI Manufacturers Association in 1991 which allows all types of media control devices to talk with each other and with computers to perform show control functions in live and canned entertainment applications. Just like musical MIDI (above), MSC does not transmit the actual show media — it simply transmits digital data providing information such as the type, timing and numbering of technical cues called during a multimedia performance.

Synchronization of MIDI sequences is made possible by the use of MIDI timecode, an implementation of the SMPTE time code standard using MIDI messages, and MIDI timecode has become the standard for digital music synchronization.

Physical Layer

The MIDI circuit is current loop, 5 mA. Logic 0 is current ON. One output drives one (and only one) input.

Only one end of the loop is referenced to ground, with the other end “floating”, to prevent ground loops which may otherwise cause interference and hum in analog audio signals. The current loop on the transmitter side drives the LED of an opto-coupler on the receiver side. This means the devices are, in fact, optically isolated.

Protocol

MIDI is an asynchronous serial interface. The baud rate is 31.25 Kbaud. There is 1 start bit (must be 0), 8 data bits, and 1 stop bit (must be 1), ie, 10 bits total (no parity, no handshake), for a period of 320 microseconds per serial byte.

Note

Due to the non-standard baud rate the MIDI cannot be used with smartCUE serial ports.

Resources

The Control of MIDI Device by CUE Control System.zip application note is available here: http://www.cuesystem.com/application_notes.aspx.

DSI

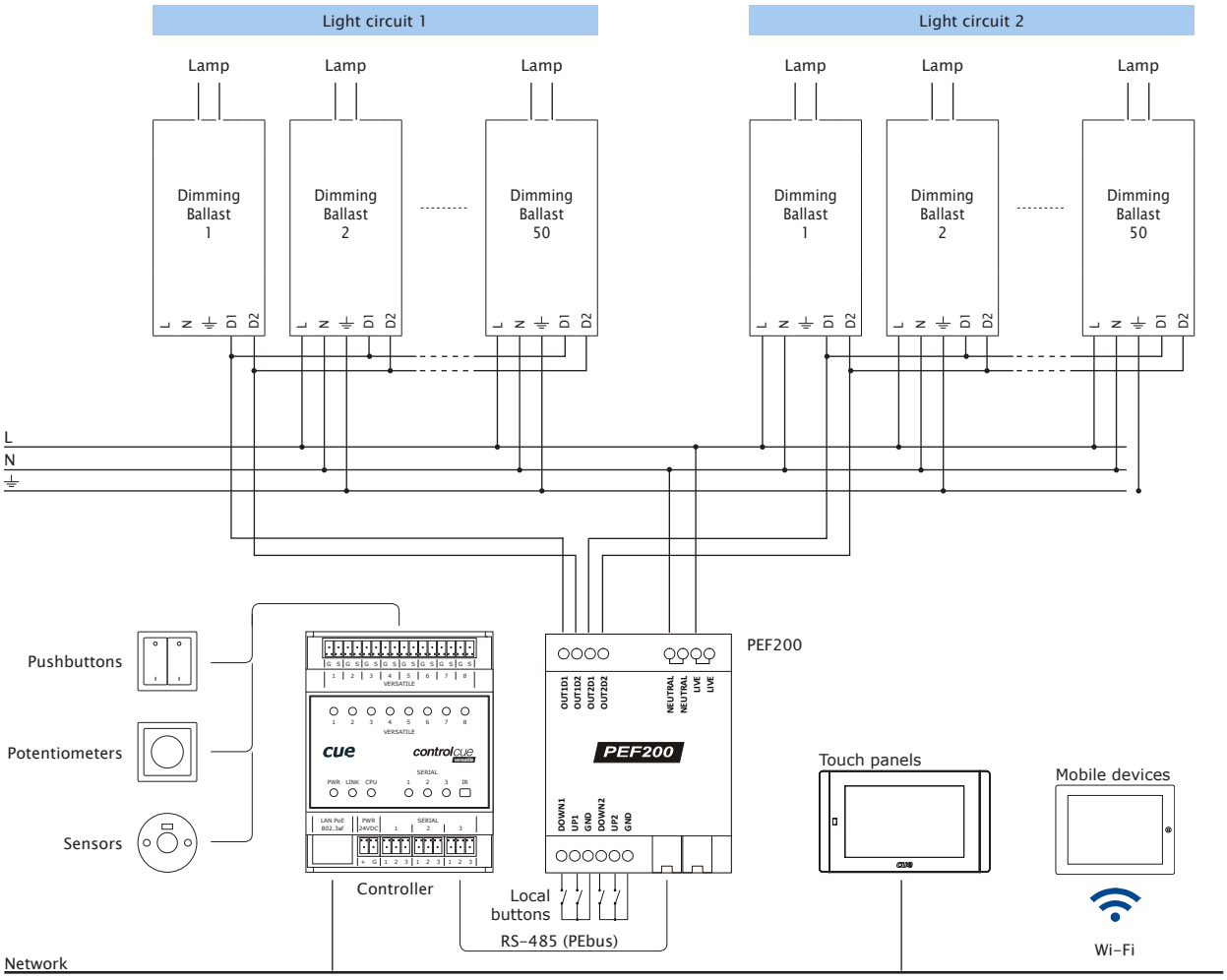
Overview

DSI (Digital Serial Interface) is a protocol for the controlling of lighting in buildings – initially electrical ballasts. The technology uses a single byte to communicate the lighting level. Because each device has its own wire to the controller (rather than being part of a network) there is no need of an address to be set, so it can be replaced simply by unplugging the faulty one and plugging in the new. These wires are not polarity dependant which makes the device easy to install.

DSI is a proprietary standard initially exclusive to Tridonic and mainly brands of Tridonic parent company Zumtobel.

Interfacing

PEF200 is a two-channel interface for fluorescent lamp dimming ballasts with DSI control signal. The maximum of 50 ballasts can be connected to each DSI output. The unit features PEbus and contact closure control. Programmable parameters are inputs response, min. and max. value of output voltage, ramp time.



Resources

http://www.cuesystem.com/interfaces.aspx

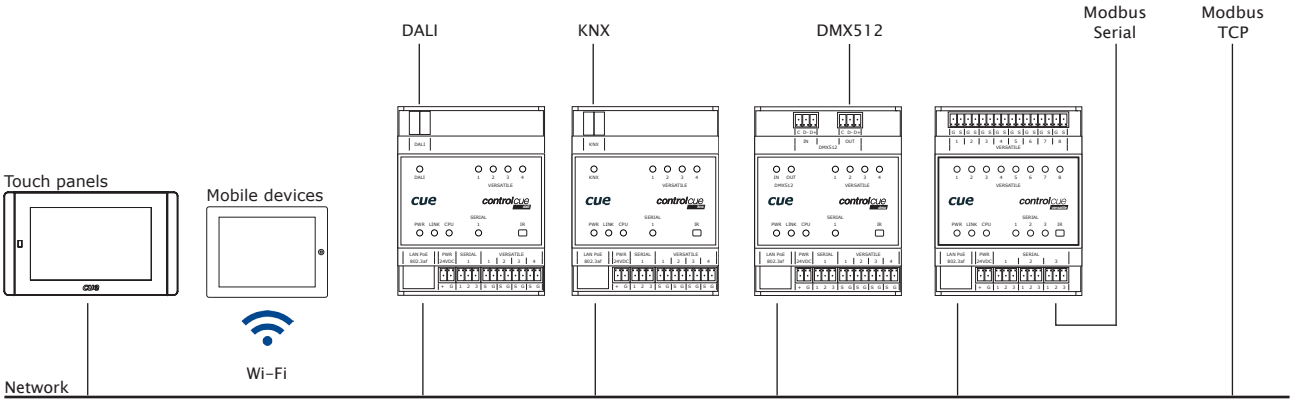
Multiple Bus Systems

Overview

The Cue System allows to combine more standard buses in one system using appropriate controllers and interfaces. Each controller is connected to the IP network. This allows to coordinate multiple standard bus networks into one seamless system and automatically manage it.

Control of all buses can be provided by touch panels and mobile devices.

Application Diagram

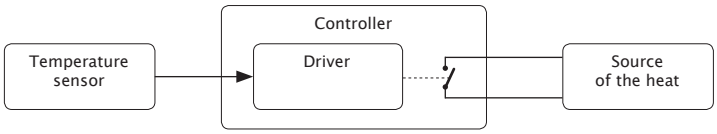


Heating, Ventilation, Air Conditioning

Relay Simple Thermostat

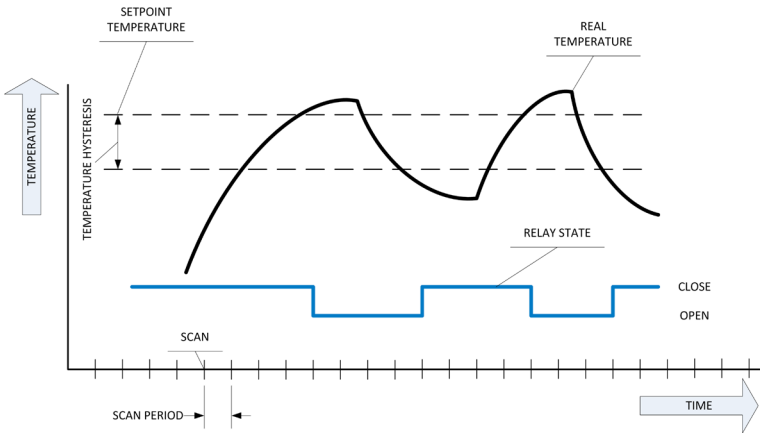
Introduction

This section describes how to integrate the ON/OFF controlled source of the heat to the Cue System. Any relay in the Cue System can be used for control and is driven by the Relay Heating Control driver.



Using the driver is simple and efficient. The driver can be simply inserted to Cue Visual Composer software and objects can be dragged and dropped to your project.

The following picture describes how the relay state is changed when real temperature changes in the time.



The driver has the following properties:

- ControlMode – defines the default control mode. It can be Open, Close, AutoScan or ManualScan.
- SetpointTemperature – defines the default setpoint (desired) temperature.
- LowTemperatureRelayState – defines the state of the relay if real temperature is lower than setpoint temperature (open or close)
- TemperatureAutoScanPeriod – defines the period of time, in which temperature is measured and relay action is performed in auto scan mode
- TemperatureHysteresis – defines the temperature hysteresis for regulation loop
- TemperatureSensorFailureRelayState – defines the state of relay if temperature sensor does not work.

States of the relay in the pictures are valid for default value of LowTemperatureRelayState (Close). When you will change property LowTemperatureRelayState to value Open, states of the relay will be opposite.

Control Modes

The driver has the following control modes:

- Open – in this control mode the output relay is permanently in the open state. There is no active regulation.
- Close – in this control mode the output relay is permanently in the close state. There is no active regulation.
- AutoScan – in this control mode the temperature is measured and the state of the relay is evaluated automatically with TemperatureAutoScanPeriod. This action is performed at the beginning of each period. This mode is useful for independent regulation of the heating source. The scan period starts when control mode is set to AutoScan (in case that this is the default state it begins when program starts) or if SetpointTemperature is changed.
- ManualScan – in this mode the state of the relay is evaluated each time the Scan() function is called. This mode is useful if you need to synchronize the regulation actions for more heating sources. In this case it is necessary to create an event scheduler with required period in your application. Then you need to place the Scan() function for all required RelayHeatingControl devices to the event raised by this scheduler.

Functions and Events

The driver offers functions for setting and getting of all properties described above and functions for convenient usage in CVC project.

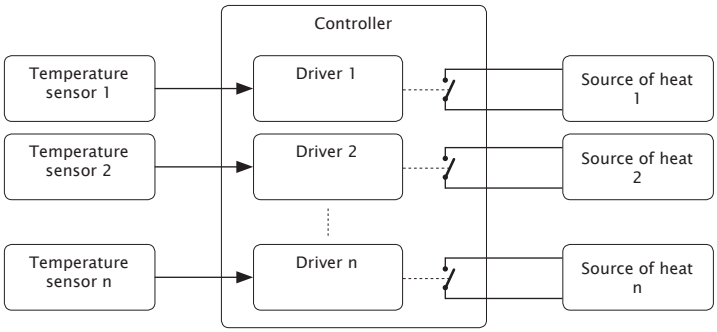
The driver generates the following events:

- OnGetRealTemperatureRequest – joins the driver with the temperature sensor.
- OnTemperatureChange – generated when driver reads real temperature from the temperature sensor or if the SetpointTemperature is changed.
- OnRelayChange – generated when the driver sets a new state of the control relay. Typically it is used to display the relay state on the touch panel.

More Thermostats in One Controller

It is possible to use more drivers (instances) in one controller and control more sources of heat. Every driver instance is customized using its own properties.

Controlled sources of heat include boilers, radiators, hot water cylinders, etc.



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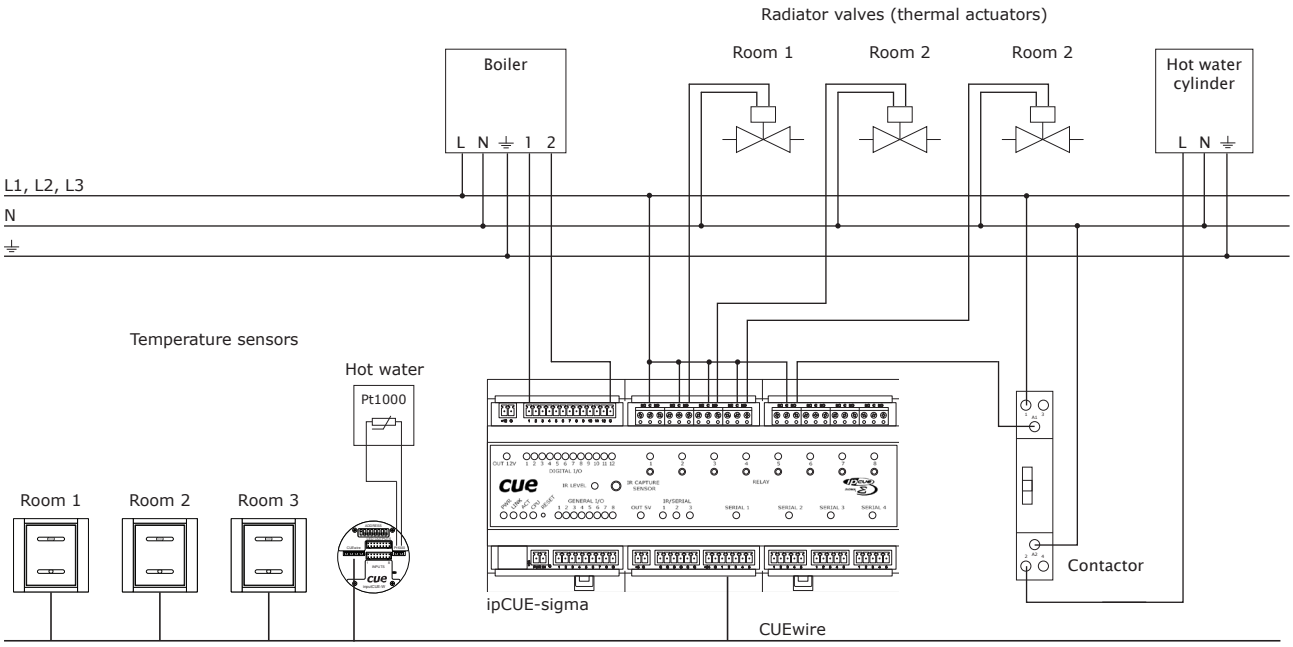
Connection

Overview

The control driver described above can be used for heater or boiler switching, radiator valves control, etc. The output control port type depends on the type of load. Some loads are low-voltage and can be driven by a low-voltage relay or a digital output (General I/O, Versatile port), some loads needs power relays. For high power loads it is necessary to use contactors.

ipCUE-sigma

The following picture describes how to connect temperature sensors and different types of loads to ipCUE-sigma.



The example above describes simple control of heating in three rooms and the control of hot water preparation.

There are three temperature sensors installed in the rooms and radiators controlled by thermal actuators. This solution allows independent room temperature control. Thermal actuators are driven directly by ipCUE-sigma relays. Our example assumes a boiler with low-voltage control input (terminals 1 and 2) driven by Digital I/O.

Hot water temperature is measured by Pt1000 temperature sensor connected to inputCUE-W. The hot water cylinder is then driven by the relay and the contactor. The contactor is used because the control system drives the power input of the hot water cylinder.

For more information on temperature measuring see the chapter Sensor and Detectors / Temperature.

For more information on thermal actuators control see the chapter Heating, Ventilation, Air Conditioning / Thermal Actuators.

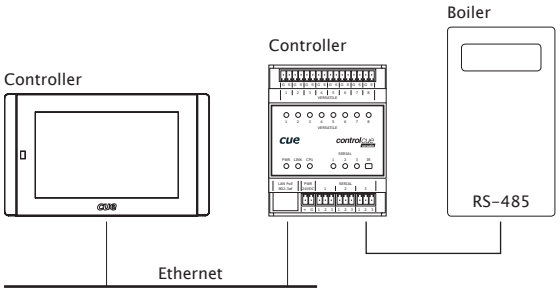
For more information on power switching see the chapter Power Switching.

Boiler Control over Modbus

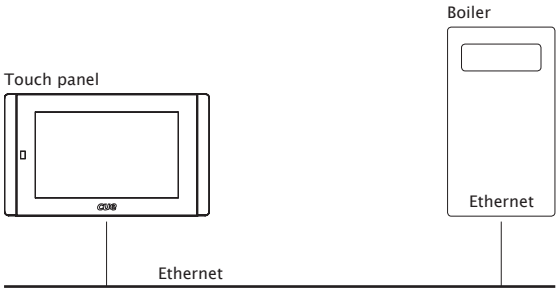
Introduction

A lot of current hi-tech boilers have a control unit with built-in Modbus protocol. There can be two basic variants, Modbus RTU or Modbus TCP.

Modbus RTU uses serial RS-485 communication. You need one free controller serial port with RS-485 capability and appropriate driver.



Modbus TCP uses Ethernet for physical connection. You need one TcpClient channel on controller or touch panel and appropriate driver.



Functionality

You can integrate the boiler with Modbus protocol by working with suitable registers. You can read a register value and display it on touch panels or you can set the required values on the touch panels, write them to the register and control the boiler in this way.

Here is an example of some boiler Modbus registers.

Example of register	Register type	Description
Outdoor Temperature	Input register	Outdoor temperature
Indoor Temperature	Input register	Real temperature in reference room
Setpoint Day Temperature	Holding register	Required daytime temperature in reference room
Setpoint Night Temperature	Holding register	Required nighttime temperature in reference room
Boiler Power	Input register	Current boiler power
Boiler Mode	Holding register	Current boiler operation mode, enumeration of the following: 0 = Boiler is switched off 1 = Boiler is switched on and setpoint DAY temperature is used 2 = Boiler is switched on and setpoint NIGHT temperature is used

For more information on Modbus see the chapter Standard Buses Interfacing / Modbus.

Resources

XPL² device drivers ModbusMaster_Serial, ModbusSlave_Serial and ModbusTCP_ModbusTCP_Tcp_Client are available in Cue Store.

Boiler Control over OpenTherm

Introduction

The trend in boiler technologies towards high-efficiency appliances with gas/air modulation and increased sophistication in control electronics has created a requirement for system communication between boilers and room controllers. At the higher end, home-systems buses provide extensive communications capability and several such systems are available, although no single standard has emerged. Generally, they all require hardware/software solutions whose cost is significant at the low end of the market, especially for point-to-point systems. Several proprietary solutions at this low end have been developed, but offer no cross-compatibility with products from different manufacturers.

There is an increasing demand for a new standard to be established to connect room controllers and boilers in a simple point-to-point fashion with very low entry-level costs. OpenTherm was developed to meet this requirement.

OpenTherm (OT) is a non-manufacturer-dependent system of communication used in central heating systems between a central heating boiler and room thermostat or controller. It is a point-to-point protocol where one device (thermostat or controller) is the master and the other the slave (boiler).

Multiple devices can be linked by using the Multi-Point-to-Point as described in Specification 3.0. But this scenario exceeds the scope of this document.

OpenTherm Characteristics

- Compatibility with so-called “dumb” or non-intelligent boiler systems
- Compatibility with low-cost entry-level room thermostats
- Compatible with electrical supplies normally found inside boilers
- Two-wire, polarity-free connection for concurrent power supply and data transmission
- Provides a suitable power supply for a room controller so that it can operate without the need for an additional power source such as batteries
- Implementable in low-cost microcontrollers with small ROM / RAM / CPU-speed requirements.
- Installer friendly feature for boiler testing. Shorting the wires at the boiler provides a simulated maximum heat demand (similar to current on/off systems).
- Allows for the transfer of sensor, fault and configuration data between the devices.
- Provides the mandatory minimum set of data objects, which allows for the transmission of a modulating control signal from the room controller to the boiler.

One of the key characteristics of the OpenTherm standard is the two-level approach which allows analogue type solutions at the low end products.

OT/+ The OpenTherm/Plus protocol provides a digital communications system for data exchange between two microprocessor-based devices.

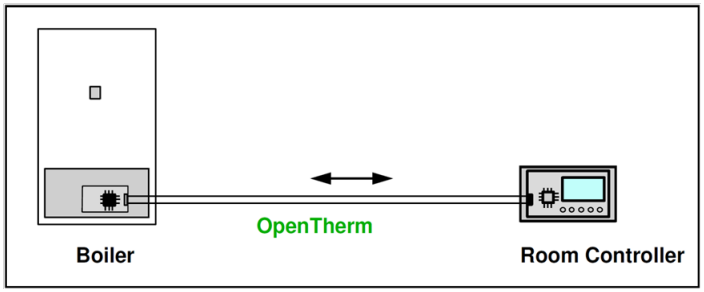
OT/- The OpenTherm/Lite protocol uses a PWM signal and simple signaling capabilities to allow implementation on analog-only products.

Both protocols use the same physical layer for data transmission and power-feeding ensuring that the two levels of communications are physically compatible.

How OpenTherm Works

OpenTherm is a point-to-point digital bi-directional communication system which connects the room controller (master) and the boiler (slave). It is not possible to connect several boilers or room controllers in the manner of bus-based systems. OpenTherm assumes that the room controller is calculating a heating demand signal in the form of a water temperature control setpoint based on room and outdoor temperature which it needs to transmit to the boiler so that it can control the output of the boiler. The boiler in turn can transmit fault and system information, status reports and requests to the room controller for display or diagnostics.

However, the most basic command is to control the boiler water temperature. When the boiler has received a temperature control setpoint command will modulate (reduce or increase the heating power) to maintain this temperature setpoint. The room controller constantly calculates what temperature the boiler water should be to maintain control of the room temperature, which results in greater energy efficiency.



Communication Media

Physically OpenTherm is a two-wire connection allowing the existing wiring to be re-used. OpenTherm is not polarity sensitive: wires can be swapped. The maximum wiring length is 50 m up to maximum 2 x 5 Ohm resistance.

OpenTherm/Plus (OT/+)

The two wires are used for both communication and power supply. In this point-to-point connection the controller is the master and the boiler the slave. The master requests by changing the voltage level, and the slave responds by changing the current. Power supply for the controller is ensured by the slave. The minimum available power is 35 mW. When using OpenTherm Smart Power this can, by master request, also be 136 mW (medium power) or 255 mW (high power).

When short circuiting the OpenTherm connection on the boiler, the boiler will start heating.

OpenTherm specifies the maximum communications interval of one second. The data in the communication packet is functionally specified and is called OpenTherm-ID (OT-ID). 256 OT-IDs are available, 128 are reserved for OEM use. The other 128 are reserved, 90 of them are functionally specified (OT Specification 3.0).

OpenTherm/Lite (OT/-)

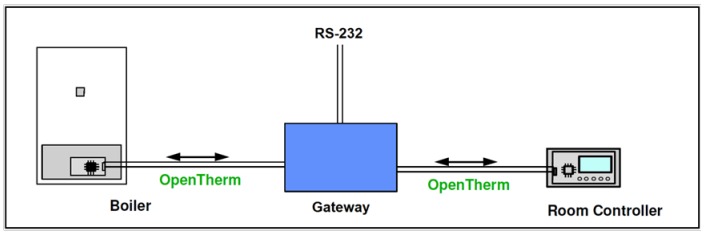
When OT/- is used, the master generates a PWM voltage signal, representing the boiler water temperature set point. The boiler current signal indicates the status of the boiler: error / no error.

If the wires forming the OpenTherm connection to the boiler are connected together (short-circuited), the boiler will start and heat up to its existing setpoint. This is a useful means of localizing a fault on a system using OpenTherm. If the boiler fires with the OpenTherm connection short-circuited, this proves that it is working, at least to some extent.

Due to the limited possibilities OT/- is rarely used.

How to Control OpenTherm from the Cue System

Because the current product line of CUE controllers / interfaces does not have OpenTherm compliant ports we recommend to use third-party OpenTherm to RS-232 gateways which can be connected to any controller or interface bi-directional serial port. See picture bellow:



The OpenTherm gateway we recommend is the one in the following link:

http://www.opentherm-gateway.com.

Features

- Forwarding OpenTherm messages between the room controller and the boiler
- Reporting on the messages on the serial interface
- Changing the room controller setpoint
- Setting the clock of the room controller
- Sending the outside temperature to the room controller
- Controlling the domestic hot water option of the boiler
- Obtaining additional information from the boiler
- Firmware updating through the serial interface

Note: Although the gateway has been customized for the combination of a Remeha Avanta boiler with a Honeywell Chronotherm Modulation thermostat, it has been proven to work with other combinations of boilers and thermostats as well.

See also

http://www.opentherm.eu

http://en.wikipedia.org/wiki/OpenTherm

http://otgw.tclcode.com

http://www.opentherm-gateway.com

Resources

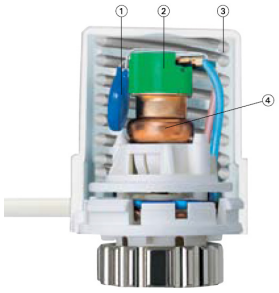
For available CUE resources contact support@cuesystem.com.

Thermal Actuators

Introduction

The thermal actuators are two point actuators for connecting to room temperature controllers with a two point output. Models with 230 VAC (with built-in over voltage protection 4 kV) and 24 V operating voltage, each current less closed (NC) or opened (NO), allow versatile application in heating, ventilation, and air conditioning systems.

Thermal actuators have an electrically heated expansion system which is secured against overtravel. The pressure power within the closed range is adapted for thermostatic valve bodies with soft valve discs. It is maintenance-free and functions without noise. Depending on the model, in a currentless status, it holds the valve closed (NC model) or open (NO model).



1 – Varistor
2 – PTC heating element
3 – Spring
4 – Expansion system

Thermal actuators can be installed in temperature and/or time related 2-point control systems in, for example

- Heating installations for floor, wall, ceiling and radiator heating systems for individual room temperature control or group control in apartments, conference rooms, storage rooms, schools, etc.
- Ventilation installations for room temperature control, e.g. controlling the flow of hot water through the air heaters.
- Air conditioning systems for room temperature control, e.g. regulating the flow of cold water from fan-coil units, ceil cooling systems, etc.

Functionality

Closed when currentless (NC model)

- Initiating operating voltage heats up the expansion system of the actuator.
- After the time lag, a uniform opening process ensues.
- If the voltage is cut off, the actuator closes via the cooling of the expansion system after the time lag.

Open when currentless (NO model)

- Initiating operating voltage heats up the expansion system of the actuator.
- After the time lag, a uniform closing process ensues.
- If the voltage is cut off, the actuator opens via the cooling of the expansion system after the time lag.

Note: When conducting a performance test, be sure to check the time response (time lag). Opening and closing times are dependent on the ambient temperature.

Connection

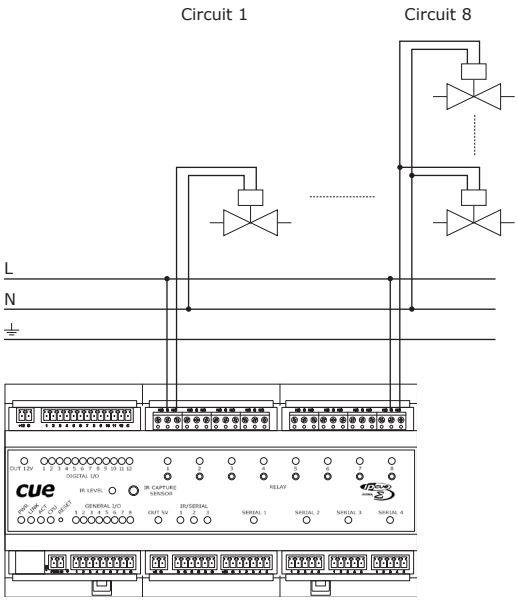
230 VAC Actuators

This version of the thermal actuator can be directly switched by a high-voltage relay.

The following units equipped with high-voltage relays can be used

- ipCUE-sigma
- relayCUE
- powerAUX
- PER610

The following picture describes how to connect thermal actuators to ipCUE-sigma.



ipCUE-sigma

Notes

- Up to eight thermal actuator circuits can be switched independently.
- The thermal actuator can be connected in parallel as described for Circuit 8. Parallel connection is suitable for example for more radiators in one room.
- Power consumption of the actuator is usually about 2 – 3 W in steady state, but it can be higher during the starting phase.
- ipCUE-sigma is a full-fledged controller with direct connection to the Ethernet. It allows to program presets, time scheduled operations, etc.
- ipCUE-sigma allows to connect thermometers, sensors, switches and other type of input devices. Finaly it is possible to use this controller as a stand-alone control system.

24 V Actuators

Overview

The thermal actuators of 24 V can be AC or DC powered and they can be switched directly by high-voltage or low-voltage relays.

The thermal actuator can be connected in parallel. Parallel connection is suitable for example for more radiators in one room. In this case check whether, if the maximum starting phase current does not exceed the relay limit.

For operation with 24 V low-voltage, a power supply is required which is in compliance with EN 60335 and possesses sufficient capacity. For dimensioning a power supply performance, the value for the operating phase needs to be taken into account. The same applies to the layout of switching contacts of the controller.

The minimum transformer power delivery results from the sum of the take-up of the 24 V thermal actuators in the operating phase.

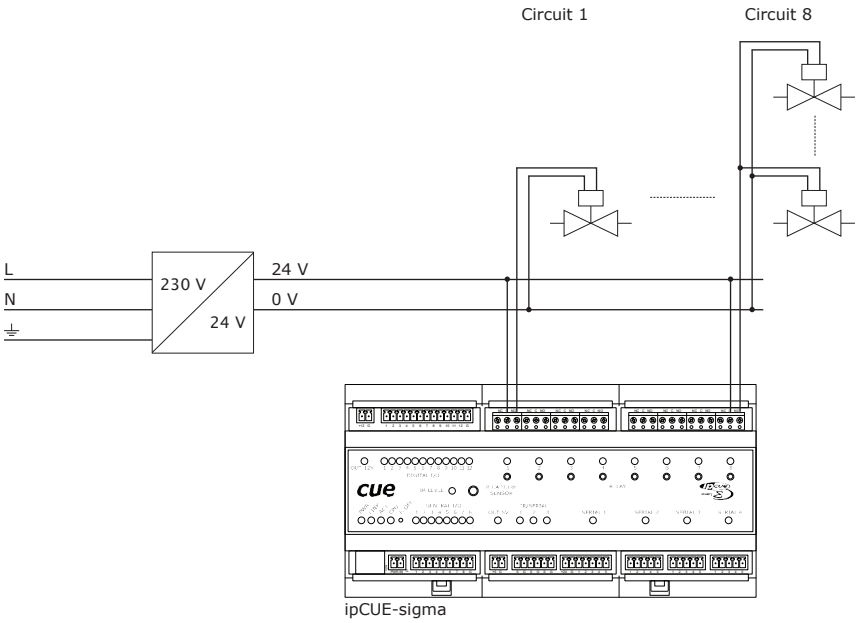
In order to maintain the declared opening times for the actuators, the voltage loss (depending on length of cable and cross section) in the operating phase on the supply lines to the actuators must not exceed 4%.

High Voltage Relays

The following units equipped with high-voltage relays can be used

- ipCUE-sigma
- relayCUE
- powerAUX
- PER610

The following picture describes how to connect 24 V thermal actuators to ipCUE-sigma.



ipCUE-sigma

Notes

- Up to eight thermal actuator circuits can be switched independently.
- ipCUE-sigma is a full-fledged controller with direct connection to the Ethernet. It allows to program presets, time scheduled operations, etc.
- ipCUE-sigma allows to connect thermometers, sensors, switches and other type of input devices. Finally it is possible to use this controller as stand-alone control system.

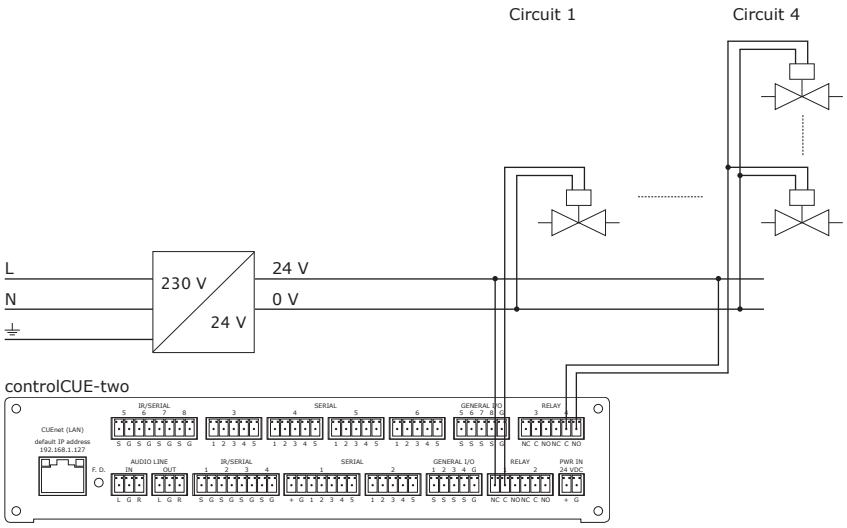
Low-Voltage Relays

The following units equipped with low-voltage relays can be used

- uniCUE-7, uniCUE-12
- controlCUE-one, controlCUE-two
- ipCUE-alpha, ipCUE-epsilon, ipCUE-delta, ipCUE-gamma
- smartCUE-two, smartCUE-two-wifi

If these low-voltage relays are used, check whether the starting phase current does not exceed 0.5 A (12 W).

The following picture describes how to connect 24 V thermal actuators to controlCUE-two.



Notes

- Up to four thermal actuator circuits can be switched independently.
- controlCUE-two is a full-fledged controller with direct connection to the Ethernet. It allows to program presets, time scheduled operations, etc.
- controlCUE-two allows to connect thermometers, sensors, switches and other type of input devices. Finally it is possible to use this controller as stand-alone control system.

Security Systems

Siemens EDP

Introduction

The aim of the connection between the Cue System and Siemens EDP is continuous monitoring and control of all detectors and subsystems connected to the security system central unit.

Available monitoring and control functions are for

- Alerts
- Areas
- Bells
- Clock
- Doors
- Outputs
- Panels
- User Names
- Zones

Enhanced Datagram Protocol

EDP (Enhanced Datagram Protocol) is a secure networking protocol designed for managing and exchanging data over low bandwidth networks, though it can be and has been used over high bandwidth networks. It has built-in support for data compression and encryption. EDP is used in SPC panels and SPC Com (e.g. SPC6000).

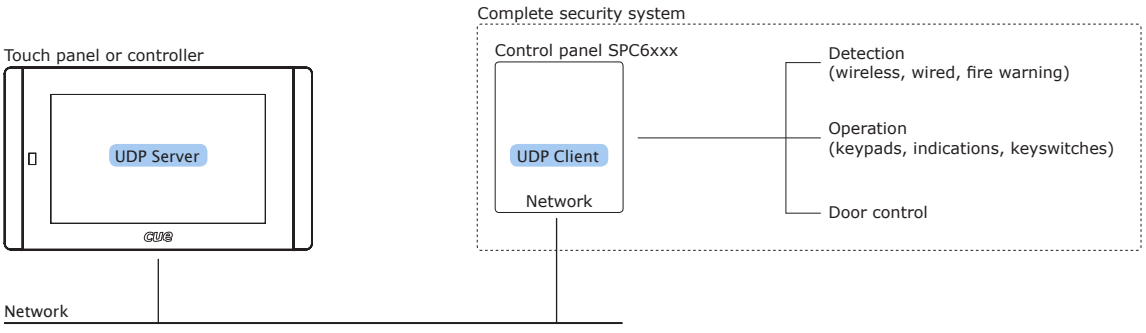
The EDP protocol was developed to address a specific market requirement for reliable and secure alarm/access reporting and management through IP network infrastructure.

The protocol is designed for transferring data securely between two end points, the alarm panel/access controller referred to as the device, and the monitoring/controlling application server referred to as the server.

UDP is the protocol used to transport EDP datagrams.

Connection

The following diagram describes how to connect CUE touch panel or controller with the complete Siemens security system based on EDP network application protocol.



The Siemens control panel acts as UDP Client which communicates with CUEunit (touch panel, controller) running the UDP Server. The application layer communication protocol is based on EDP described above.

Functionality

The CVC device driver offers functions and events described in the following tables.

Functions

Group	Description	Functions
Alerts	Command that restores all alerts (system, zone and E-NET alerts).	Restore all alerts
Area	Command that set an area or a system.	Set and unset area Part set A and B Get area status
Bells	This command silences all bells in the panel.	Silence all bells
Clock	Command that sets the panel clock.	Set clock
Doors	Commands that control doors.	Inhibit and de-inhibit door zones Isolate and de-isolate door zones Open doors momentarily or permanently Set doors to normal mode Lock doors Get doors status
Outputs	Commands that set and reset user outputs.	Set outputs Reset outputs Get outputs status
Panels	Command that gets the panel status.	
User Names	Command that gets a list of user names.	Get list of user names
Zones	Commands that operate on zones.	Inhibit zones and de-inhibit zones Isolate zones and de-isolate zones Get zone status

Events

Event	Description
SIAevent	SIA event
SIAevent burglary alarm	Burglary alarm

Resources

The Siemens_SecuritySystem_EDPserver_Udp_Server ready-to-use driver is available in Cue Store.

Honeywell Galaxy Smart

Introduction

The aim of the connection between the Cue System and Honeywell Galaxy Smart alarm and security system is continuous monitoring and control of all detectors and subsystems connected to a security system central unit.

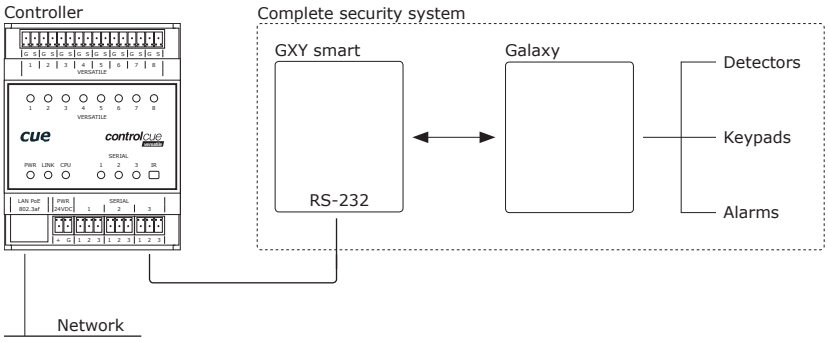
Monitoring and control functions are available for

- Groups
- Zones
- Alarms
- Errors

Connection

To connect Galaxy Smart to the Cue System, the GXY Smart module has to be used. This module provides an interface between Galaxy Smart and third-party systems through bi-directional RS-232 serial channel.

One bi-directional serial channel RS-232 on any CUE controller can be used.



Resources

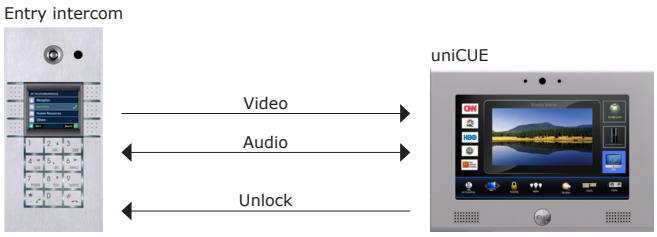
For details contact support@cuesystem.com.

Entry Systems

Entry Communicator

Introduction

The entry communicator solution provides doorbell notification of visitors at a door or gate and it enables one-way visual communication to identify the visitor on a touch panel. Two-way audio conversation can be established between the touch panel and the entry intercom and then the function door/gate open can be done directly from the touch panel.

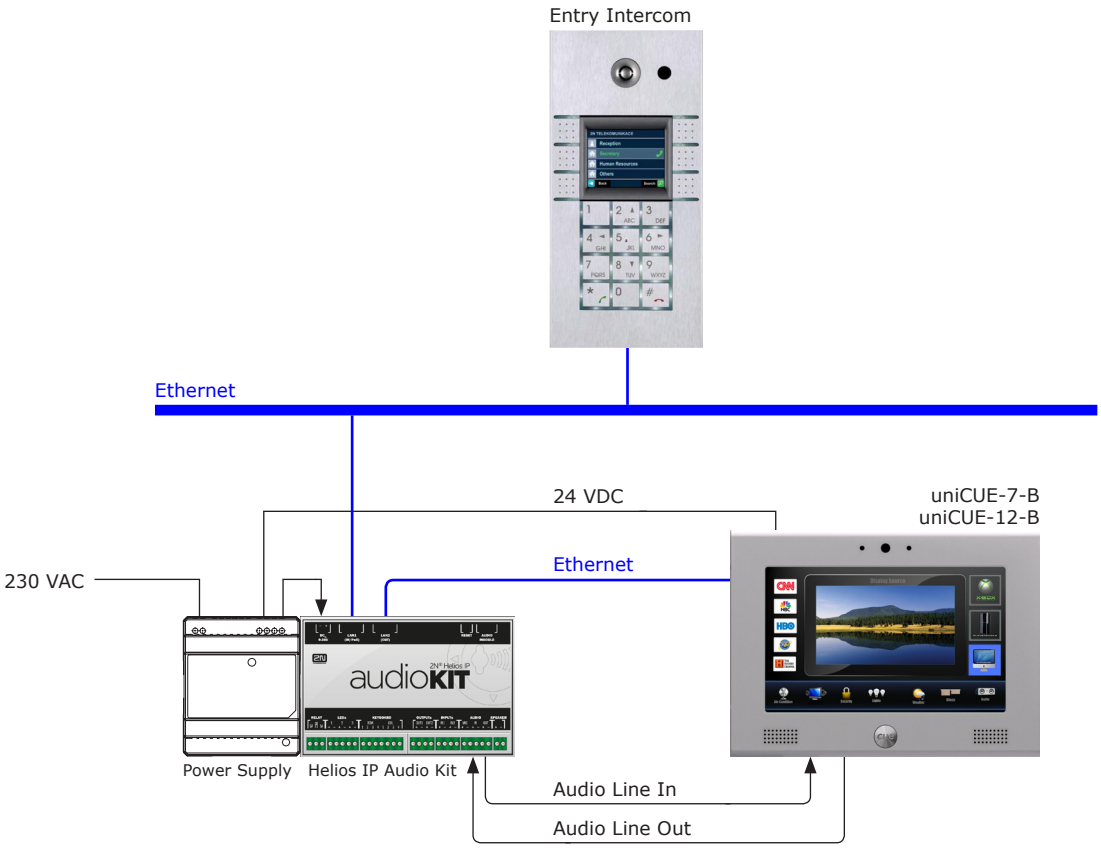


This solution is designed for companies, hotels, homes, flats and all other applications where it is necessary to solve the access of visitors.

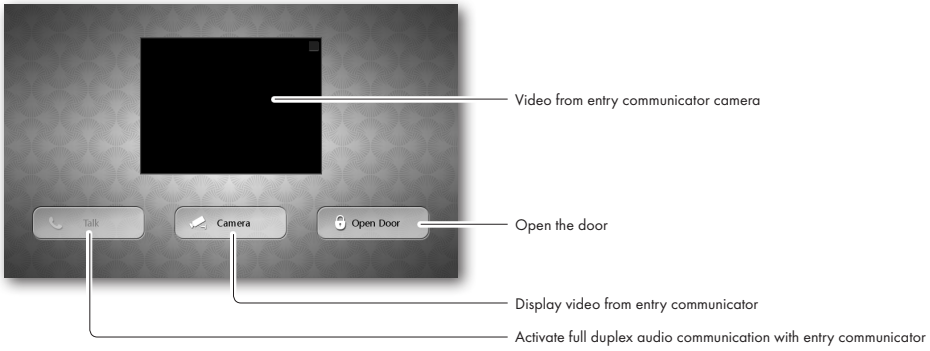
Application Diagram

The current solution allows to use both uniCUEs as indoor communication touch panel.

As described in the following picture the Entry Intercom is connected to the local network and it is provided with Power over Ethernet. On the other hand, the IP Audio Kit and touch panel controller uniCUE are connected to the local network too. In addition, an in/out audio line has to be provided to connect the IP Audio Kit and the touch panel controller. It is recommended to install the IP Audio Kit close to the touch panel controller to eliminate potential problems with analog audio on long cables.



Touch Panel Screen Example



Order Information

The entry communication solution is delivered as a package including

- Entry intercom – can be selected from various models and configurations.

- IP Audio Kit
- Touch panel controller uniCUE-7 or uniCUE-12
- Accessories

Resources

For more information about ordering and delivery contact sales@cuesystem.com.

For more technical information contact support@cuesystem.com.

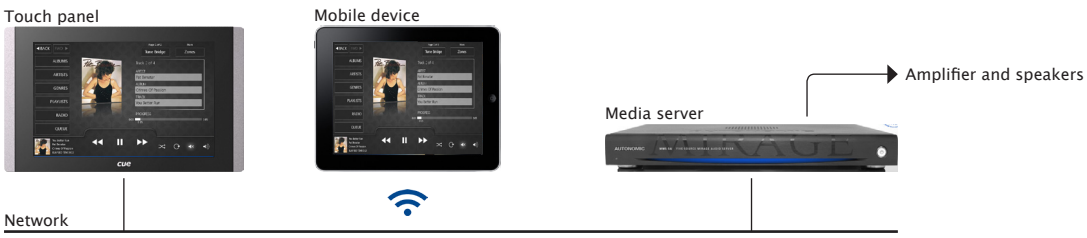
Media Control

Autonomic Controls Mirage

Description

The Autonomic Controls Mirage widget is a graphic collection, device driver and connection module, which makes it possible to control Autonomic Controls Mirage media server within CUE touch panels. All objects are created using standard Cue Visual Composer software and XPL[2] programming language.

User interface and driver can run on all current touch panels and mobile device runtimes as described in the following picture. This widget is not compatible with older touch panels airCUE-6X-xx, airCUE-8X-xx, touchCUE-4X-xx, touchCUE-6X-xx, touchCUE-12-X-xx.



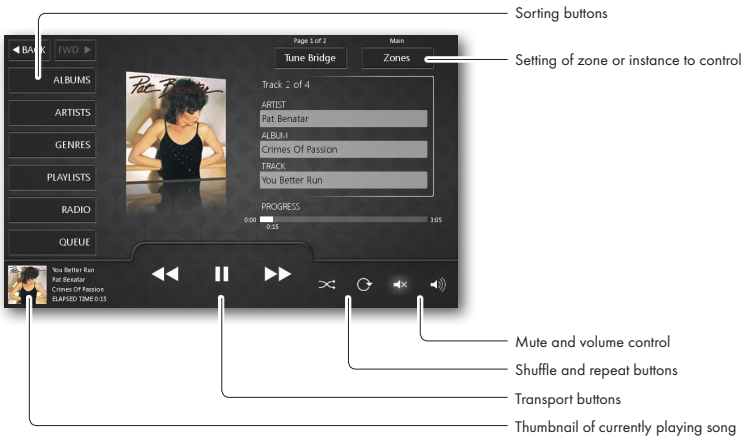
The widget communicates with the Autonomic Mirage server via Telnet protocol and album art pictures are get by HTTP get method.

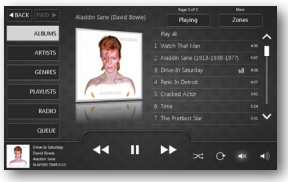
For Autonomic Controls Mirage widget activation you need to purchase the registration key. Registration is bound to the hardware product serial number. Without registration the Autonomic Controls Mirage widget runs for one hour and then stops.

User Interface

The server can be controlled in the same way as on the Mirage server web pages. The graphic object can be used on any window in the touch panel layout. The size of the object is variable and a number of album art pictures displayed on the screen can be set from 3x2 to 5x3, default is 4x2. The graphic object does not have its own background. It enables you to use your own favourite picture as a background and customize the graphic interface design.

Screen examples





Resources

The widget is available in Cue Store.

Select Categories – Widgets, then Category – All and download AutonomicControlsMirageWidget.

Audio and Video

Introduction

Overview

CUE touch panels and controllers facilitate the playback of video and audio streams from IP cameras and video servers. These units also make it possible to play files stored in internal flash memory. Thanks to this feature, CUE touch panels can be used as monitors for video surveillance of homes and so on.

Some CUE devices are equipped with the audio line input, audio line output, microphone and speakers. See the following table for overview.

Model	Touch Panels	Touch Panel Controllers	Controllers
Microphone	● (1)	●	
Speakers	● (1)	●	
Line Input		●	● (1)
Line Output		●	● (1)

(1) Not all touch panels and controllers are equipped with these features. For details see the appropriate product cut sheets.

The following table describes how to use audio in CUE units.

	Output		
Input	Speakers	Line output	File
Microphone		Entry communicator	Voice memo input
Line input	Entry communicator	Volume control	Voice memo input
Sound from resources	Sound effects	Sound effects	
Sound from file	Sound effects Voice memo output	Sound effects Voice memo output	
Sound from IP stream	Intercom	Intercom	

Note

CUE devices are not equipped with analog video inputs and it is necessary to use the IP video server as described in the following section. Analog video is converted to IP stream in the IP video server and then wired or wireless touch panels can display the streaming video as described in the relevant sections.

Streaming Audio and Video

Introduction

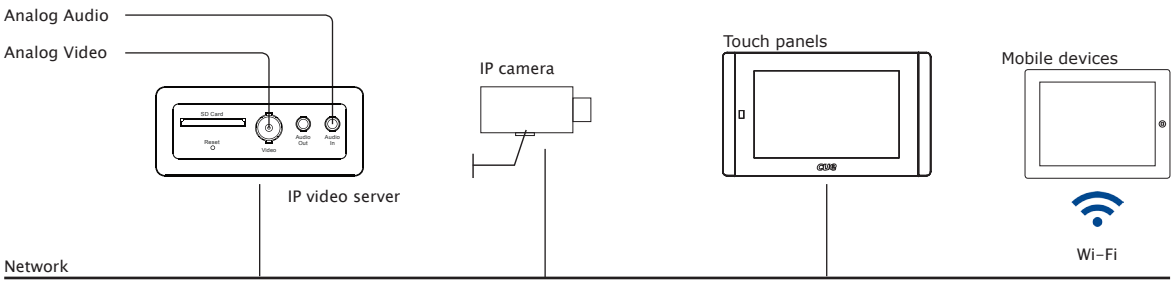
Streaming is a network technology which makes it possible to send live multimedia signals over the standard LAN (Local Area Network) without the necessity to have a dedicated infrastructure for the audio and video.

Sources of multimedia streams are generally created by two types of devices – by IP cameras or by video servers.

- An IP camera is a video camera which has a wired (Ethernet) or wireless (Wi-Fi) network port and which sends multimedia streams to LAN.
- A video server usually has a standard analog video and audio input (composite, S-video) and LAN port. The server converts input video and audio signals to a stream and sends it to LAN. The video server allows you to use standard analog video sources for streaming.

Video and audio signals are usually compressed by standard codecs to save the network bandwidth used by these streams.

In the Cue System, touch panels and mobile devices are used for the viewing of multimedia streams.



Two basic things on the IP camera or AV server must be configured

- Suitable codec
- RTSP stream or HTTP MJPEG stream.

Unfortunately, there is not one standard, as every manufacturer uses their own way of configuration. The configuration is usually set by the administration web pages of the device, for details refer to the user's manual of your camera.

Suggested IP Servers

Manufacturer	Model
AVTech	AVX931A
Axis	Q7401
	Q7404
	Q7406
Sony	SNT-EX101
	SNT-EX104
Vision	NVS102
Vivotek	VS7100
	VS2403
	VS8102
	VS8401
	VS8801

Supported Protocols, Containers and Codecs

Touch Panels and ipCUE-omega

	Touch Panels [1] Touch Panel Controllers	ipCUE-omega
Protocols		
From local file	●	●
HTTP	●	For MJPEG only
RTSP (RTP, SDP)	●	
Containers		
MJPEG	●	●
AVI	●	
MPEG/PS, MPEG/TS	●	
OGG	●	
RTP	●	
Video Codecs		
MJPEG	720x576 30fps | 864x480 30fps	●
MPEG-4 DivX | XviD | H.263	720x576 30fps | 864x480 30fps	
H.264 Baseline Profile Level 3.0 [2]	720x576 30fps | 864x480 30fps	●
H.264 Main Profile		
H.264 High Profile		
WMV	720x576 30fps | 864x480 30fps	●
MPEG-1| MPEG-2 | Theora	864x480 25fps 2Mbps	
MPEG-2		●
Audio Codecs		
MPEG-1/2/3	●	
AAC	●	●
WAV	●	●
OGG/Vorbis	●	
FLAC	●	
AC3		●

[1] All current models

[2] THIS PRODUCT IS LICENSED UNDER THE AVC PATENT PORTFOLIO LICENSE FOR THE PERSONAL USE OF A CONSUMER OR OTHER USES IN WHICH IT DOES NOT RECEIVE REMUNERATION TO (i) ENCODE VIDEO IN COMPLIANCE WITH THE AVC STANDARD ("AVC VIDEO") AND/OR (ii) DECODE AVC VIDEO THAT WAS ENCODED BY A CONSUMER ENGAGED IN A PERSONAL ACTIVITY AND/OR WAS OBTAINED FROM A VIDEO PROVIDER LICENSED TO PROVIDE AVC VIDEO. NO LICENSE IS GRANTED OR SHALL BE IMPLIED FOR ANY OTHER USE. ADDITIONAL INFORMATION MAY BE OBTAINED FROM MPEG LA, L.L.C. SEE HTTP://WWW.MPEGLA.COM.

Mobile Devices

	pcCUE	iCUE [1]	aCUE
Protocols			
From local file	●		
HTTP	●	●	●
RTSP (RTP, SDP)			● [3]
Containers			
MJPEG	●	●	●
Other containers installed with an operating system	●		● [2]
Video Codecs			
MJPEG	●	●	●
Other video codecs installed with an operating system	●		● [2]
Audio Codecs			
Audio codecs installed with an operating system	●		● [2]

[3] iCUE–standard and iCUE–professional version 4.31.20 or higher.

[2] For Android containers and codecs see http://developer.android.com/guide/appendix/media-formats.html.

[3] For video playback only.

Resources

For details how to program audio and video see

- CVC Help / Documentation / Video Object Collection
- CVC Help / Contents / Commands / Audio
- CVC Help / Contents / Commands / Video.

Intercom

Introduction

CUE touch panels and some controllers support Push-to-talk (PTT) intercom over IP network.

Push-to-talk is a method of having conversations or talking on communication lines using a momentary button to switch from the voice reception mode to the transmit mode. Push-to-talk calls provide half-duplex communications — while one person transmits, the other(s) receives.

Intercom functions are supported by the following units:

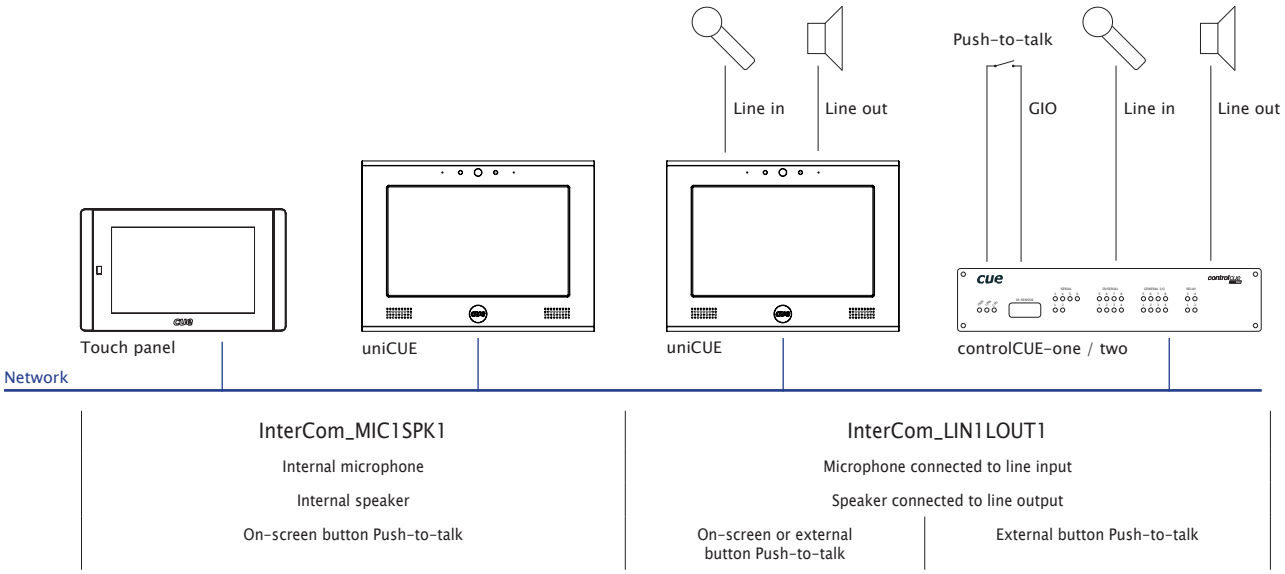
- Touch panels
- Touch panel controllers
- controlCUE-one
- controlCUE-two

There are two intercoms:

- InterCom_MIC1SPK1 uses internal microphone and speaker of touch panels and uniCUEs.
- InterCom_LIN1LOUT1 uses line input and line output of uniCUEs and controlCUE-one / two.

Both intercoms can be combined in the same project. That means for example that the touch panel with an internal microphone and speaker can communicate with controlCUE-one/two, where the microphone and the speaker are connected to the line input and the line output.

The following picture describes all possible combinations.



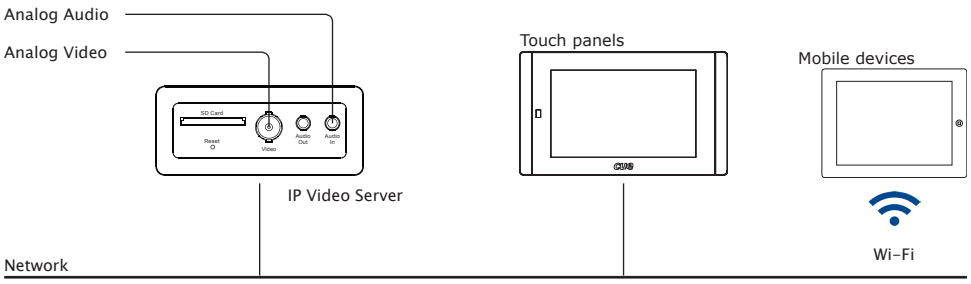
Resources

For more details see CVC Help / Commands / IntercomClass.

Analog Audio and Video Sources

Description

CUE devices are not equipped with analog video inputs. For analog video and audio sources (incl. cameras with analog outputs) it is necessary to use the IP video server as described in the following picture.



Analog audio and video is converted to the IP stream in the IP video server and then wired or wireless touch panels can display the streaming video and audio as described in the relevant sections.

For more details on streaming audio and video see the section Streaming Audio and Video.

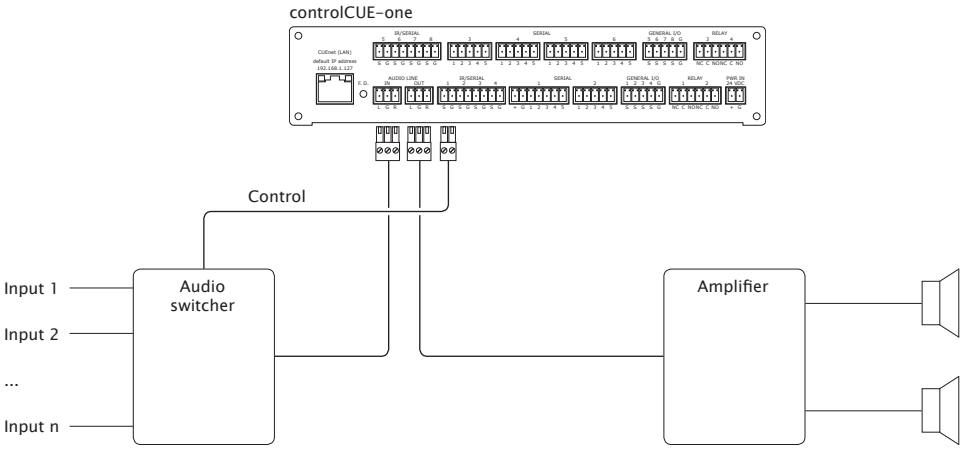
Volume and Input Gain Control

Description

The following units are equipped with audio line input and output and they can be used as volume and input gain control units

- controlCUE-one
- controlCUE-two
- uniCUE-7
- uniCUE-12

A connection example is described in the following picture.



Volume is controlled by the line output volume control command and, in addition, input gain can be controlled independently for each input using line input gain control.

Resources

For more details on available line input and output commands see CVC help.

Energy Monitoring

Introduction

Overview

Solutions in energy monitoring

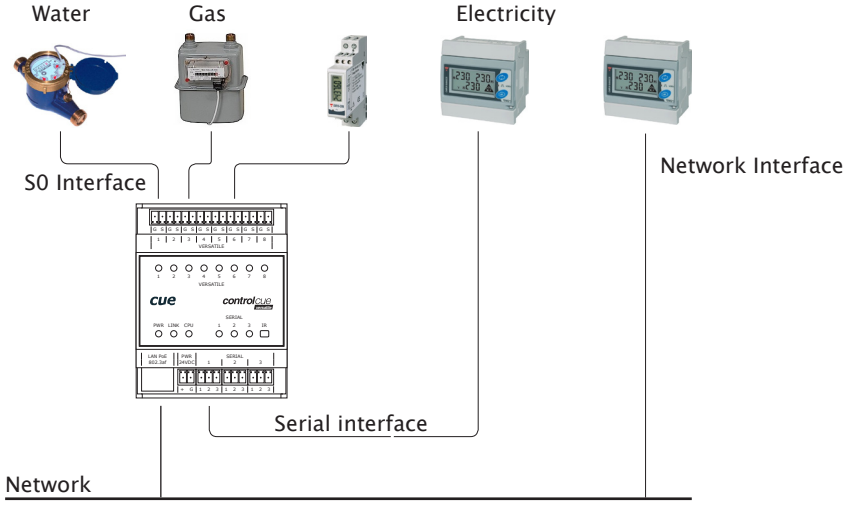
- Meeting essential energy measurement needs with a simple metering solution
- Getting essential electrical information for each area of a building
- Viewing and monitor the energy used by lighting installation
- Analyzing energy consumption online
- Managing energy in small-sized to medium-sized buildings
- Managing and sub-billing energy in large commercial buildings
- Analyzing energy data to optimize the operation of buildings.

Energy Meters

Energy meters serve for energy consumption monitoring, being typically used for water, gas and electricity.

The Cue System can be used with existing third-party energy meters equipped with

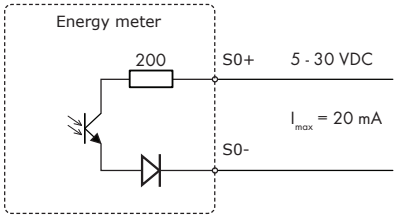
- S0 (pulse output) interface
- Serial interface
- Ethernet.



S0 Pulse Interface

Introduction

Many meters have pulse outputs, including electricity meters (single phase, 3-phase), gas meters, water flow meters, etc. In the case of an electricity meter a pulse output corresponds to a certain amount of energy passing through the meter (kWhr/Whr). For single-phase domestic electricity meters each pulse usually corresponds to 1 Whr (1000 pulses per kWhr). In the case of higher power meters (often three-phase), each pulse corresponds to a greater amount of energy eg. 2 Whr per pulse or even 10 Whr per pulse.

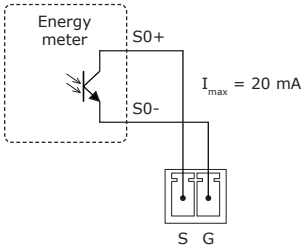


This picture describes an S0 interface based on the norm EN 62053-31.

Devices are divided into the following classes:

- Class A: power supply 27 VDC
- Class B: power supply 15 VDC

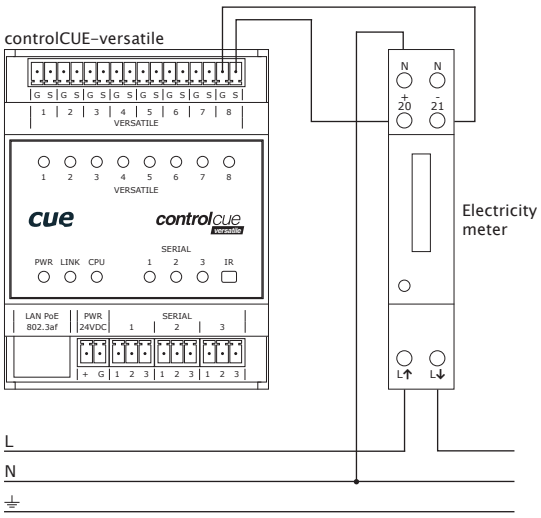
Connection



Pulse outputs from third-party meters (S0 interface) can be connected to the following control ports:

- Versatile
- General I/O
- Digital I/O

The appropriate control port then serves as a pulse counter.



This example describes how to connect an electricity meter to a versatile port.

Be aware to keep the polarity of the S0 pulse output and connect terminal 20 (+) to the signal (S) of the Versatile port and terminal 21 (-) to the ground (G).

The Versatile port uses an internal pull-up, which means external power supply is not necessary.

For proper functionality it is recommended to use a controller with uninterruptible power supply (UPS). This will guarantee proper energy metering during power outage.

Serial Interface

Introduction

The serial channel of a third-party energy meter is connected to the controller serial channel and then values can be read out over the serial communication. The serial interface is typically RS-485 with Modbus RTU communication protocol.

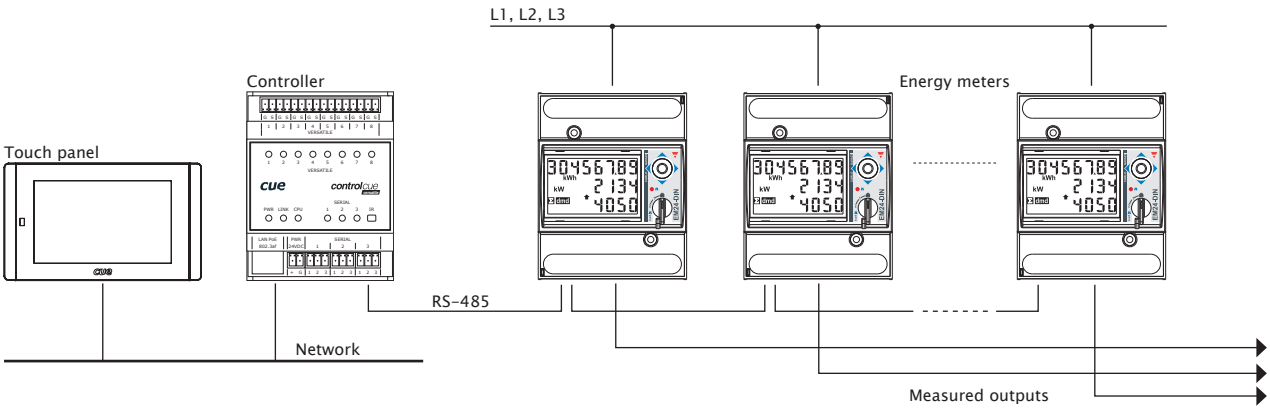
Energy Meter EM24-DIN

Overview

The Carlo Gavazzi EM24-DIN is a three-phase energy analyzer with the built-in LCD data displaying. It is particularly indicated for active and reactive energy metering and for cost allocation. It provides the DIN rail compatible housing and makes it possible the connection up to 65 A. Moreover, the meter can be provided with RS-485 interface supporting the Modbus RTU protocol.

For more information see http://www.gavazzi-automation.com/.

Application Diagram



Resources

The Carlo_Gavazzi_EnergyMeter_EM24_Serial driver is available in Cue Store.

Ethernet Connection

Introduction

Third-party energy meters equipped with Ethernet port can be directly monitored using any controller or touch panel. Communication protocol is typically Modbus TCP.

Energy Meter WM30

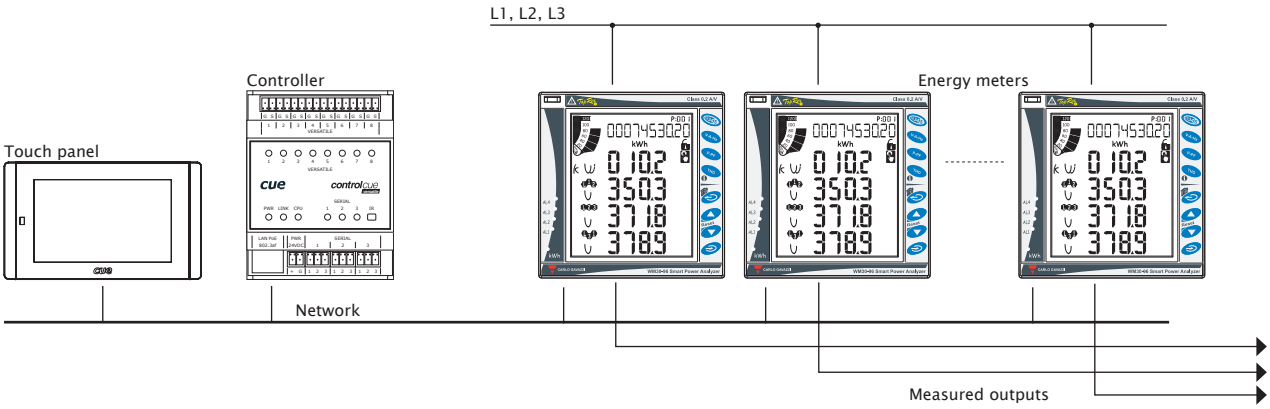
Overview

The Carlo Gavazzi WM30 is a three-phase smart power analyser with a built-in advanced configuration system and LCD data displaying. It is particularly recommended for the measurement of the main electrical variables. WM30 is based on a modular housing for panel mounting. Moreover, the analyser can be provided with digital outputs that can be either for pulse proportional to the active and reactive energy being measured or/and for alarm outputs. The instrument can be equipped with the following modules: RS485/RS232, Ethernet, BACnet-IP or BACnet MS/TP communication ports, pulse and alarm outputs.

For more information see http://www.gavazzi-automation.com/.

Application Diagram

This solution uses the Modbus TCP communication protocol.



Resources

The Carlo_Gavazzi_EnergyMeter_WM30_Tcp_Client driver is available in Cue Store.

Remote Management

Cue Site Manager

Description

Cue Site Manager (CSM) is a software solution for IT staff and asset management allowing to remotely monitor and control boardrooms, offices, auditoriums, classrooms, private homes, flats, etc. and their associated controlled devices. Each site can be identified by name, group and location.

Monitor

The system monitors any system attribute – lights, room temperature, volume, projector lamp life and power, etc. For each attribute the threshold value and condition can be defined and if this condition is reached, one of the following actions will be triggered.

- Help request informs the administrator that someone on site needs help. Typically this action is triggered using the Help button on the touch panel.
- Maintenance request informs the administrator that some site needs maintenance. For example, the air filter of the pojector may need to be cleaned.
- Service request informs the administrator that a service is required. For example, the projector lamp needs to be replaced.
- Security alert informs administrator about some security issue. For example, the projector has lost connectivity. It can also indicate that the projector has been stolen.

All actions described above can be customized to perform the following tasks:

- Displaying on administrator application
- Sending information to predefined e-mail addresses
- Writing to log file

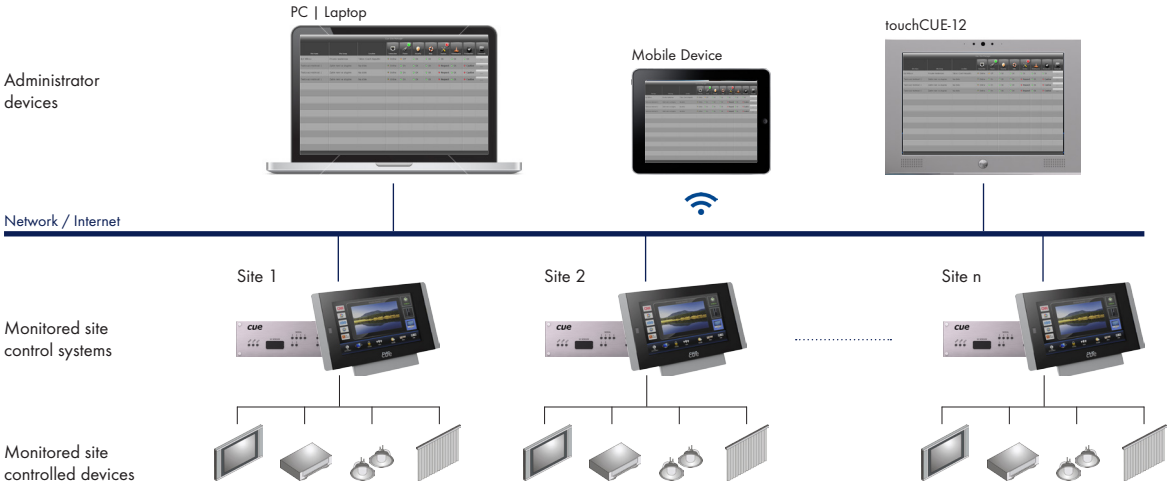
Control

Each site has a set of predefined commands which can be executed by the administrator. For example, the administrator can switch on / off the projector, set the room preset or light scene, etc.

Features

- Communication is secured by a password and a unique transaction ID to avoid unauthorised access.
- Each site offers additional information for the administrator – owner, phone number, prestige, equipment list, number of seats, etc.
- The administrator can sort the site view according to the site name, group, location, identification, connection, power and actions.

Application Diagram



Resources

http://www.cuesystem.com/software_applications.aspx

GSM SMS

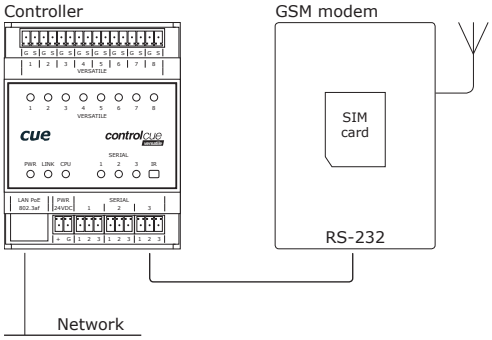
Description

The SMS (Short Message System) of a standard mobile phone can be used for remote site monitoring and controlling. The SMS service provided by the service providers is comparatively very low cost and SMS allows text messages to be sent and received to and from the control system. This feature can be implemented for a variety of applications. The main attractive feature of this system is that the user can monitor and control the site from any part of the world.

The user may get the status of a remote site such as temperature, security system status, etc. by sending the respective SMS to the monitored site. The monitored site also automatically sends a SMS to the user if any error or alarm occurs during its operation, which is previously defined by the user. The user may then take the necessary action depending on the type of alarm through the respective SMS or in any other way.

Connection

The GSM modems are typically equipped with the RS-232 serial interface. The connection requires one bi-directional serial channel RS-232 on a controller as described in the following picture.



Resources

Drivers Siemens_GSM_MC45_Serial and Siemens_GSM_TC35_Serial are available in Cue Store.

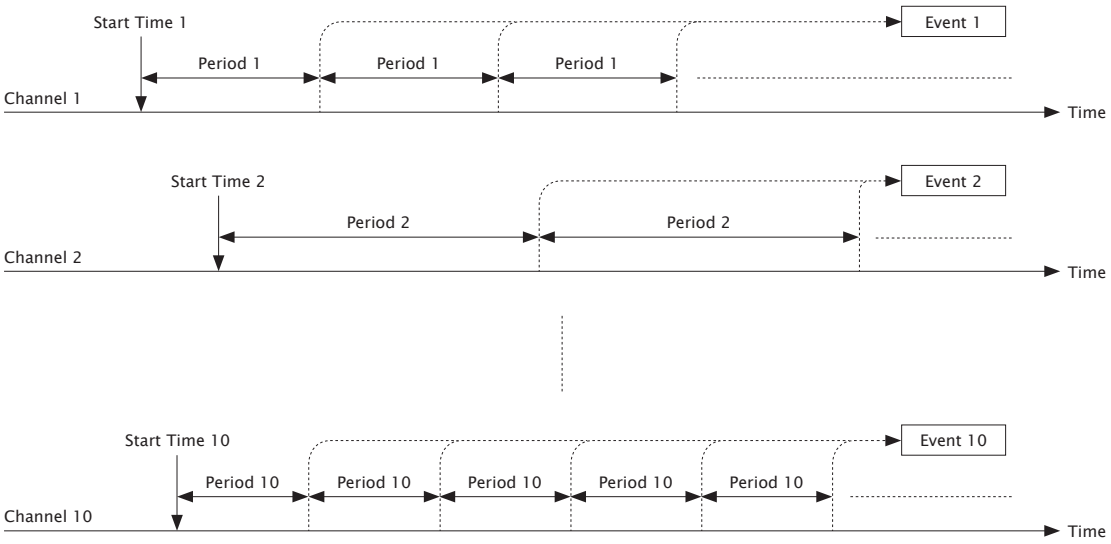
Triggered Operations

Simple Scheduler

Description

All controllers and touch panels keep date and time using its on-board real time clock (RTC), thus allowing for a wide variety of distributed intelligence scheduling applications.

The SimpleScheduler is a Cue Visual Composer (CVC) applet, which makes it possible to generate up to ten events periodically. You can place the desired commands to the processes linked with these events.



Each scheduler channel has its own name, start time and period. Individual channels can be enabled and disabled.

The minimum period and period precision is one minute and events are generated at the start of a minute.

Events with period smaller than two hours are generated with this period independently of the summer or winter time. Events with period longer or equal to 2 hours will be performed at a fixed time of the day. For example, an event with period of one day generated every day at midnight will be generated every midnight of the local time (on the day where the daylight saving time shift occurs, the period will be increased or decreased by the daylight saving time shift).

Resources

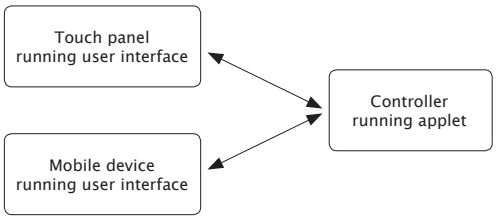
The applet SimpleScheduler is available in Cue Store.

Event Scheduler

Description

All controllers and touch panels keep date and time using its on-board real time clock (RTC), thus allowing for a wide variety of distributed intelligence scheduling applications.

The Scheduler is a Cue Visual Composer (CVC) applet, which makes possible to periodically generate weekly planned events. Desired commands are programmed in processes linked with the event.



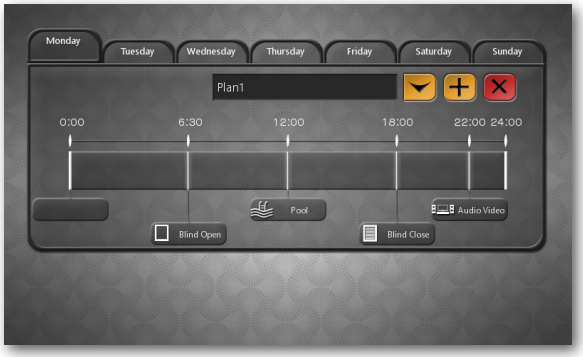
The Event Scheduler is divided into two parts.

- The applet runs in a controller all the time, stores scheduler data and provides scheduling.
- The graphic object serves for editing and can run on control panels incl. wireless touch panels or mobile devices, which can be sometimes switched off. This configuration allows to use more control panels for editing.

The following user interface screen shots describe the basic functionality of the scheduler.

Basic view

A weekly scheduler with events. Week day is selected using tabs. Every event has its specific name and icon. Events are created by the drag-and-drop method.

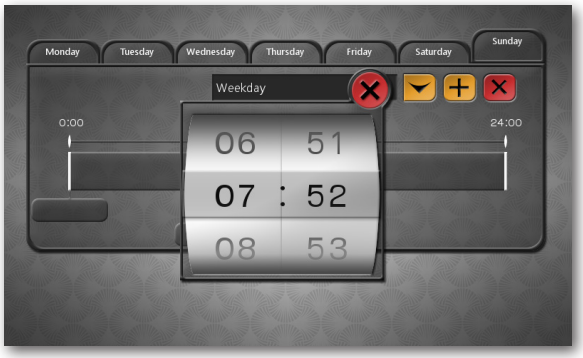


Creating a plan

The scheduler can use more plans with different names. It allows to create well-arranged week plans for different types of operations.

Set event time

The time of events can be set by the drag-and-drop method and fine-tuned using the rotary picker.



List of events

The Name and icon of each event can be selected from the list.

Resources

For more information contact support@cuesystem.com.

Sunrise Sunset Timer

Description

The SunriseSunsetTimer is a Cue Visual Composer (CVC) applet, which makes it possible to calculate the sunrise and sunset times and generate events in these times. Calculations are based on an algorithm published on the following pages: http://williams.best.vwh.net/sunrise_sunset_algorithm.htm.

The applet has the properties of zenith and location. It generates events and offers functions which can be used in XPL[2] programming.

Zenith

It is possible to choose the zenith angle, for which the sunrise and sunset are calculated. Possible options are

- Official – the zenith angle in which the sun is just below the horizon.
- Civil – the center of the sun disc is 6 degrees below the horizon.
- Nautical – the center of the sun disc is 12 degrees below the horizon.
- Astronomical – the center of the sun disc is 18 degrees below the horizon.

For a detailed description see for example http://en.wikipedia.org/wiki/Twilight.

Location

The location for which the sunrise–sunset is calculated is defined by latitude (positive for North, negative for South) and longitude (positive for East, negative for West).

Events

The SunriseSunsetTimer applet automatically generates process events when there is sunrise or sunset. It is possible to place the desired commands to processes linked with these events.

- Commands for sunrise can be for example: open blinds, switch off exterior lighting, etc.
- Commands for sunset can be for example: close blinds, switch on exterior lighting, etc.

Functions

Most practical functions are

- Calculation whether it is daytime or nighttime. For example, this function can block the automatic switch on the gate light during daytime.
- Calculation of sunrise and sunset times for the current day. These times can be displayed on a touch panel for information about sunset and sunrise.

Resources

The SunriseSunsetTimer applet is available in Cue Store.

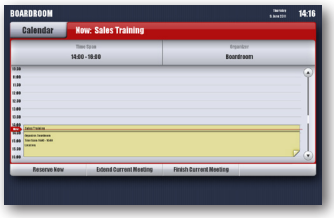
Reservation System

Microsoft Exchange Server® Solution

Description

The Cue Reservation System (CRS) is an application that expands the range of user functions offered by the Cue System. It is a software solution allowing to plan, schedule and manage conference rooms, lecture rooms and other spaces using CUE touch panels. Microsoft Exchange Server® 2007/2010 is used for planning. In this software, each room has its own account, and its calendar is used to plan the occupation and use of rooms. Cue units communicate with the server through the Cue Exchange Connector application.

Thus it is now possible to use CUE touch panels not only for the controlling of AV technology, lighting or heating, but also for reserving rooms, viewing their booking schedules or showing events that are currently taking place there.

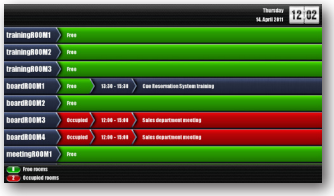


The main function of the Cue Reservation System is a representation of the currently running event in a room (the name of event and the period of time it runs for) as well as a representation of the nearest events to come. By touching the representation of the event on the screen, the user can view details of the event (the organizer, the importance, public or private character of the event, etc.). It is also possible to browse through a list of events taking place in the following days as well as those that took place in the previous days.

It is presumed that the touch panels of the reservation system will be placed in two locations: at the entrance to the room and inside the room.

- Panels placed in front of the entrance serve mainly for informing about events taking place in the room. Useful functions of the touch panel include the possibility of booking the room.
- Panels inside the room are used mainly for controlling all the technology, the reservation system being one of the controlling pages in these panels.

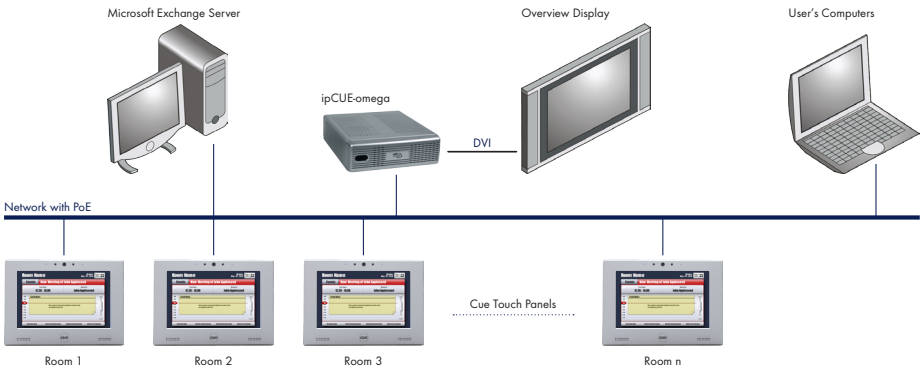
There are other functions of the reservation system that are suitable for these panels, for example the ending of the current event (and thus making the room available) or the prolonging of the event. The operator can take advantage of these functions if a planned event ends earlier or if it is necessary to prolong the time planned for the event.



The Cue Reservation System also makes it possible to connect an external monitor (placed for instance at the reception) and view the list of all events in all rooms.

It is of course possible (independent of Cue Reservation System) to plan room schedules through standard client applications for the Exchange Server, i.e. using the Microsoft Outlook® program.

Application Diagram



Resources

http://www.cuesystem.com/software_applications.aspx

Weather

Daily Weather Online

Description

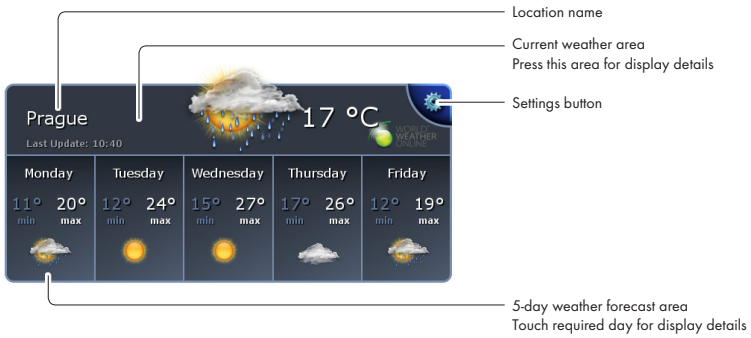
The Daily Weather from World Weather Online™ widget is an RSS reader, which allows to display weather forecast on CUE touch panels. Weather forecast data are downloaded from World Weather Online™ server.

The widget runs on CUE touch panels or mobile devices with firmware version 4.31 or higher and resolution of 640 x 480 pixels and higher. The CUEunit (controller or touch panel) must have one free TcpClient channel and stable internet connection with working DNS (Domain Name Server).

Obtaining weather data from World Weather OnlineTM is subject to registration. After registration you will obtain an API key. We recommend to use a unique API key for each project to reduce the number of requests and spend minimum period of time by reading weather forecast data from the server.

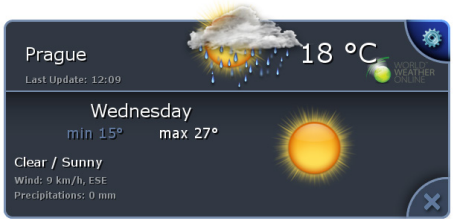
The graphic object can be used on any window in a touch panel layout. The size of object is fixed to 600 (w) x 300 (h).

Basic Screen



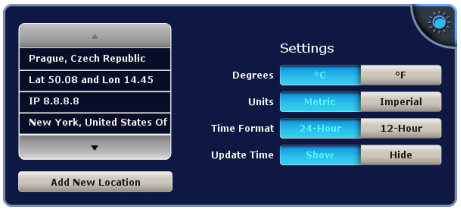
Current Weather Details

Weather Forecast Details



Settings

Settings – New Location



Resources

The widget is available in Cue Store.

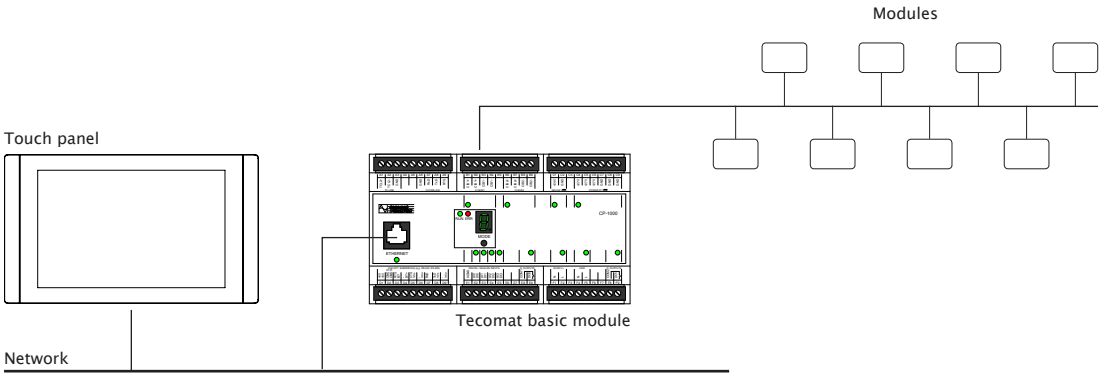
Select Categories – Widgets, then Category – All and download DailyWeatherFromWorldWeatherOnline.

Third-Party Systems

Tecomat PLC EPSNET

Description

The Tecomat PLC EPSNET is a set of XPL[2] drivers for interfacing the Tecomat automation system through Ethernet.



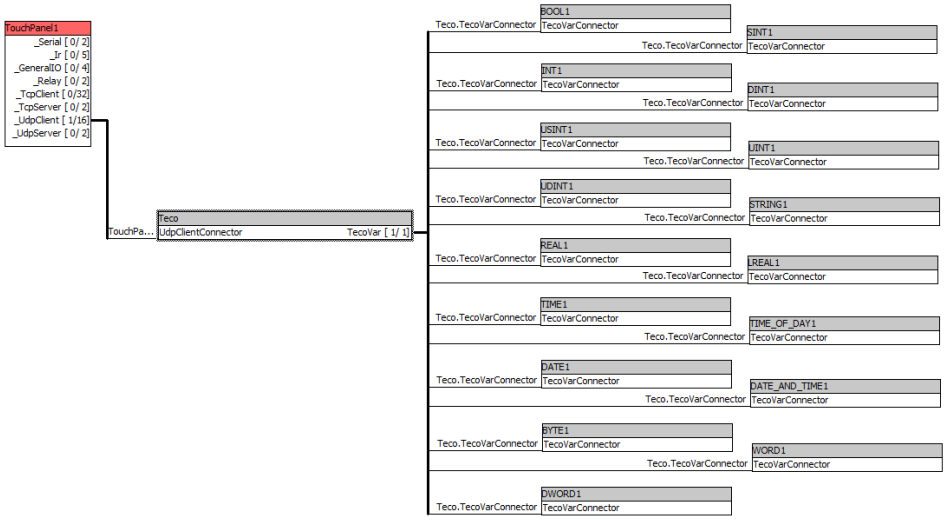
This solution facilitates sending and receiving data concerning the state of variables via the EPSNET protocol. When you create a project for Tecomat PLC in Mosaic environment, you must generate a *.pub file with the definitions of variables used in your project. You must create projects where all functionality will be ensured through variables.

The Tecomat devices can be simply inserted into Cue Visual Composer software and all objects can be dragged and dropped into the project. Every instance of the object is customized using object properties.

Tecomat devices are divided into two types:

- Tecomat PLC UDP client for EPSNET – the main resource for communication with Tecomat PLC. Other devices are connected to this main device.
- Tecomat PLC variables – devices for reading, writing and capturing events for each type of variable. The devices are as follows: Tecomat_BOOL, Tecomat_SINT, Tecomat_INT, Tecomat_DINT, Tecomat_USINT, Tecomat_UINT, Tecomat_UDINT, Tecomat_REAL, Tecomat_LREAL, Tecomat_TIME, Tecomat_DATE, Tecomat_TIME_OF_DAY, Tecomat_DATE_AND_TIME, Tecomat_STRING, Tecomat_BYTE, Tecomat_WORD, Tecomat_DWORD. Those variables types are all variables types used in Mosaic IDE.

CVC configuration example:



In order to use Tecomat PLC EPSNET Device Driver, you need to register it. Registration is bound to the CUE hardware product serial number (where Tecomat PLC EPSNET Device Driver is connected).

Resources

For details contact support@cuesystem.com.

Wiring Diagrams

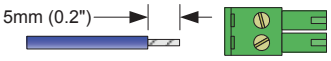
Connector Wiring

CABLE PREPARATION FOR PHOENIX CAPTIVE SCREW CONNECTORS

The length of the exposed wires in the stripping process is critical. **The ideal length is 5 mm (0.2")**.

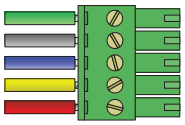
- If the stripped section of the wire is longer than 5 mm, the exposed wires may touch, causing a short circuit between them.
- If the stripped section of the wire is shorter than 5 mm, the wires can be easily pulled out even if tightly fastened by the captive screws. Insulation stripped shorter than 5 mm can electrically isolate the connection as well.

The wires also must not be tinned. Tinned wire does not hold tight in the captive screws and can break easily after several bends.

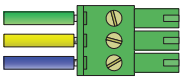


RS-232 bi-directional (ports SERIAL)

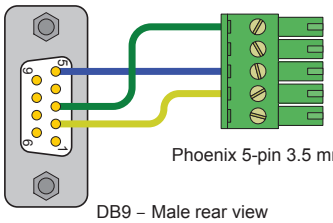
Pin	Signal	Description	Direction	Phoenix 5-pin 3.5 mm
1	TxD	RS-232 Transmitted Data	From the unit	
2	RTS	RS-232 Request to Send	From the unit	
3	GND	Ground		
4	RxD	RS-232 Received Data	To the unit	
5	CTS	RS-232 Clear to Send	To the unit	



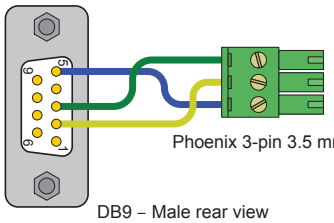
Pin	Signal	Direction	Phoenix 3-pin 3.5 mm
1	TxD	From the unit	
2	RxD	To the unit	
3	GND		



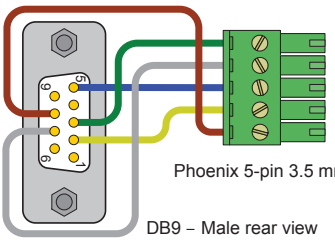
Standard serial cable with DB9 – Male w/o handshake



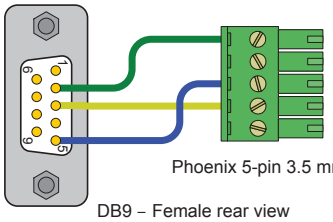
Standard serial cable with DB9 – Male w/o handshake



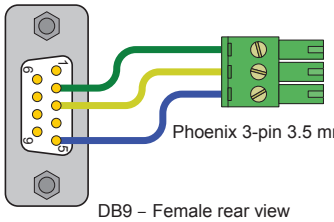
Standard serial cable with DB9 – Male with handshake



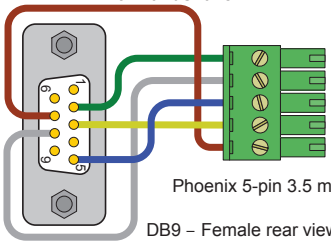
Standard serial cable with DB9 - Female w/o handshake



Standard serial cable with DB9 - Female w/o handshake



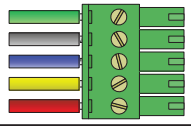
Standard serial cable with DB9 – Female with handshake



Caution: Check with the manufacturer for the serial cable pinouts. Do not assume your equipment serial hookup uses standard pinouts.

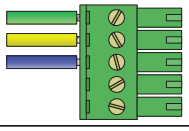
RS-422 bi-directional (ports SERIAL)

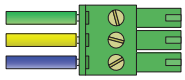
Pin	Signal	Description	Direction	Phoenix 5-pin 3.5 mm
1	Tx A+	RS-422 Transmit Data (idles high)	From the unit	
2	Tx B-	RS-422 Transmit Data (idles low)	From the unit	
3	GND	Ground		
4	Rx A+	RS-422 Receive Data (idles high)	To the unit	
5	Rx B-	RS-422 Receive Data (idles low)	To the unit	



RS-485 (ports SERIAL)

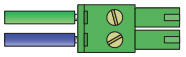
Pin	Signal	Description	Phoenix 5-pin 3.5 mm	Phoenix 3-pin 3.5 mm
1	A+	RS-485 Data +		
2	B-	RS-485 Data-		
3	GND	Ground		
4	N.C.	Not connected		
5	N.C.	Not connected		





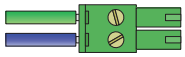
IR output (ports IR/SERIAL)

Pin	Signal	Description	Phoenix 2-pin 3.5 mm
1	S	IR signal output	
2	G	Ground	

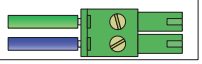


Analog output (ports ANALOG)

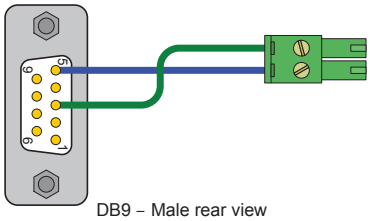
Pin	Signal	Description	Phoenix 2-pin 3.5 mm
1	S	Analog output signal 0 – 10 V	
2	G	Ground	



RS-232 serial outputs (ports IR/SERIAL)

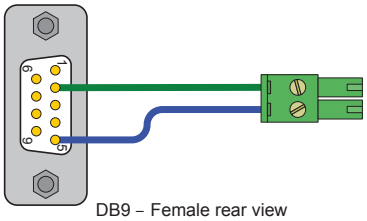
Pin	Signal	Description	Direction	Phoenix 2-pin 3.5 mm
1	S	TxD (RS-232 Transmitted Data)	From the unit	
2	G	Ground		

Standard serial cable with DB9- Male one-way communication



DB9 – Male rear view

Standard serial cable with DB9- Female one-way communication



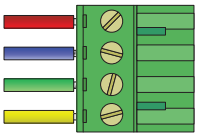
DB9 – Female rear view

Caution: Check with the manufacturer for the serial cable pinouts. Don't assume your equipment serial hookup uses standard pinouts.

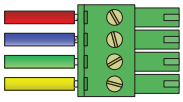
RS-485 (CUEwire*)

Pin	Signal	Description
1	+24	Power +24 VDC
2	G	Ground
3	A+	RS-485 Data +
4	B-	RS-485 Data -

Phoenix 4-pin 5.08 mm

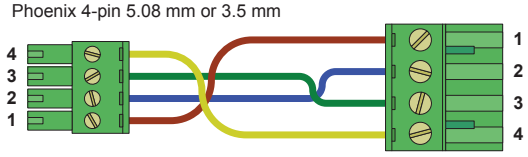


Phoenix 4-pin 3.5 mm



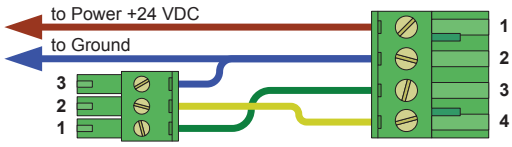
CUEwire cable

Phoenix 4-pin 5.08 mm or 3.5 mm



Phoenix 4-pin 5.08 mm or 3.5 mm

RS-485 to CUEwire cable

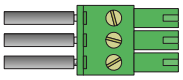
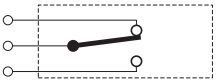
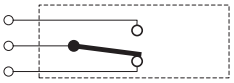


Phoenix 3-pin or 5-pin 3.5 mm to RS-485 compatible serial port

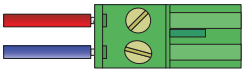
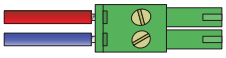
Phoenix 4-pin 5.08 mm or 3.5 mm to CUEwire port

* port S3 (ipCUE-beta, ipCUE-gamma, ipCUE-epsilon), port S7 (ipCUE-alpha, ipCUE-delta)

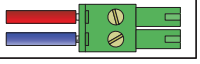
RELAY

Pin	Signal	Description	Phoenix 3-pin 3.5 mm	Open relay inside the unit	Close relay inside the unit
1	NC	Contact normally close			
2	C	Contact common			
3	NO	Contact normally open			

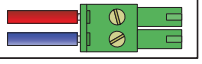
PWR IN (24 V or 12 V)

Pin	Signal	Description	Phoenix 2-pin 5.08 mm	Phoenix 2-pin 3.5 mm
1	+	Power +24 VDC (+12 VDC)		
2	G	Ground		

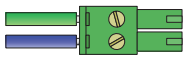
OUT 5 V, max. 1 A

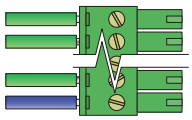
Pin	Signal	Description	Phoenix 2-pin 3.5 mm
1	+5	Out +5 V DC	
2	G	Ground	

OUT 12 V, max. 800 mA

Pin	Signal	Description	Phoenix 2-pin 3.5 mm
1	+12	Out +12 V DC	
2	G	Ground	

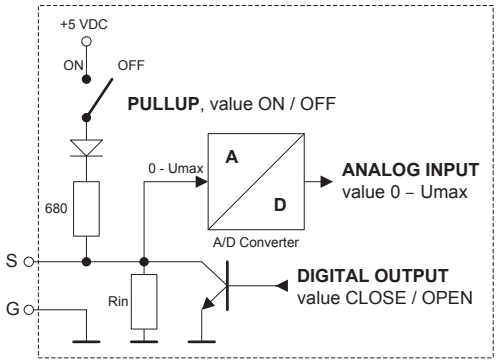
GENERAL I/O

Pin	Signal	Description	Phoenix 2-pin 3.5 mm
1	S	Input / output signal	
2	G	Ground	

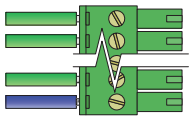
Pin	Signal	Description	Phoenix N-pin 3.5 mm
1	S	Input / output signal	
2	S	Input / output signal	
N-1	S	Input / output signal	
N	G	Ground	

Model	Umax	Rin	A/D Converter
ipCUE-alpha, ipCUE-gamma, ipCUE-delta, ipCUE-epsilon	5 V	510 kOhm	10-bit (i.e. 1024 levels)
ipCUE-sigma	20 V	210 kOhm	10-bit (i.e. 1024 levels)
controlCUE-one, controlCUE-two, uniCUE-7-B, uniCUE-12-B	5 V	66 kOhm	10-bit (i.e. 1024 levels)
smartCUE-three, smartCUE-three-wifi	20 V	26 kOhm	12-bit (i.e. 4096 levels)

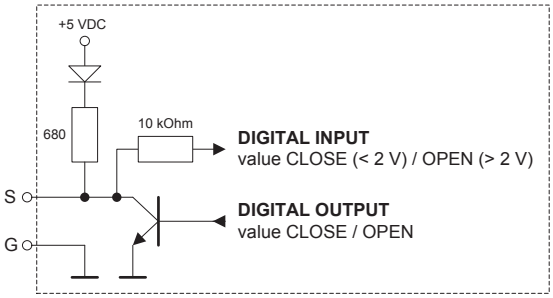
General I/O port inside the unit



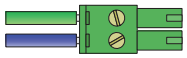
DIGITAL I/O

Pin	Signal	Description	Phoenix N-pin 3.5 mm
1	S	Input / output signal	
2	S	Input / output signal	
N-1	S	Input / output signal	
N	G	Ground	

Digital I/O port inside the unit

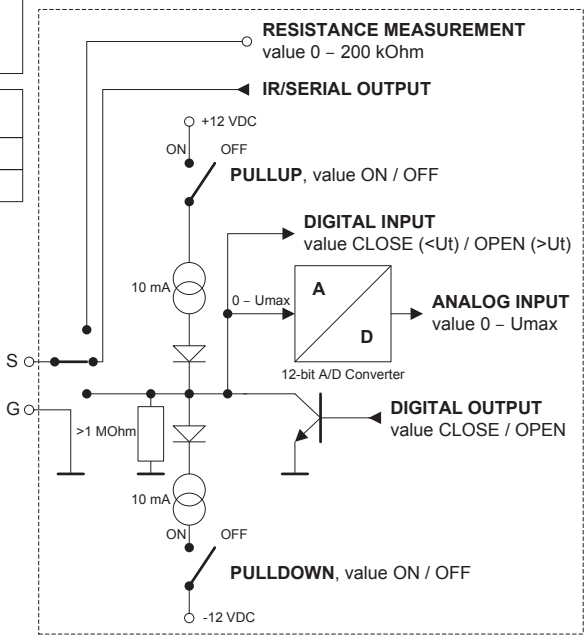


VERSATILE

Pin	Signal	Description	Phoenix 2-pin 3.5 mm
1	S	Input / output signal	
2	G	Ground	

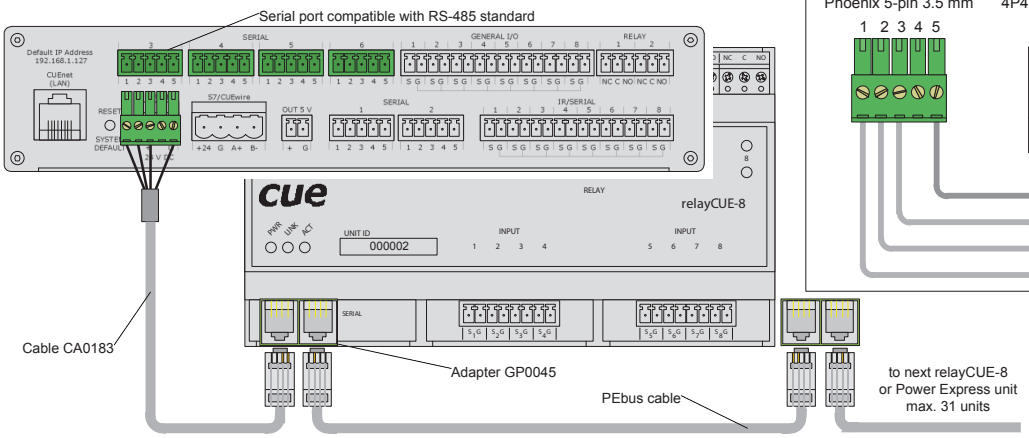
Input \ Voltage range	High	Low
ANALOG INPUT max. voltage Umax	10 V	2.5 V
DIGITAL INPUT threshold voltage Ut	6 V	1.5 V

Versatile port inside the unit

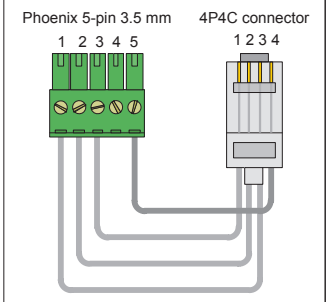


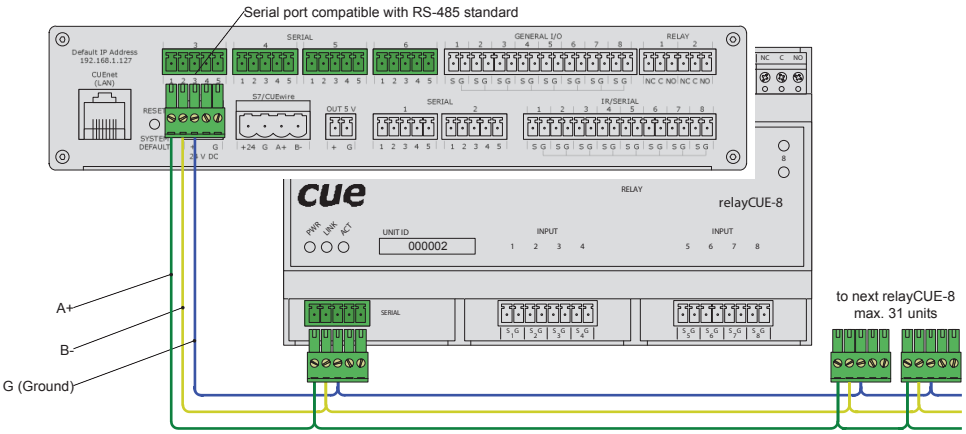
relayCUE-8 Serial Port Connection

RS-485 SERIAL Port Connection

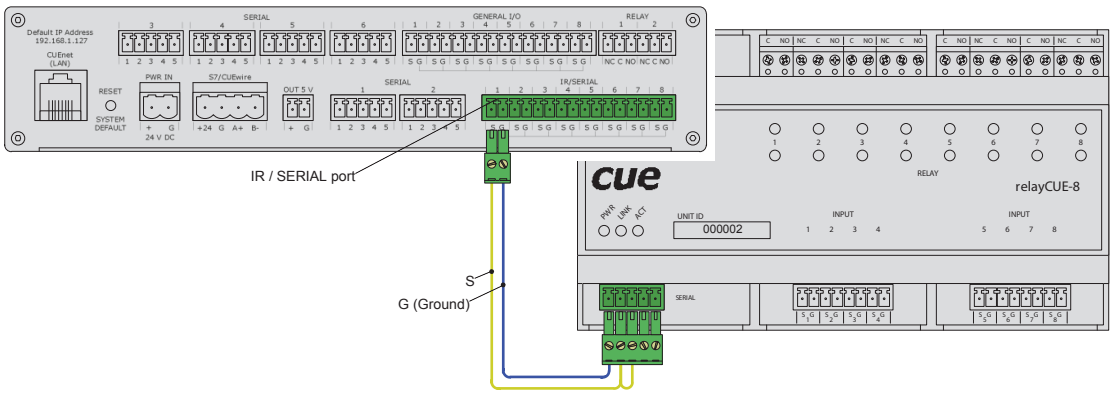


Cable CA0183





IR / SERIAL Port Connection



Note: only one relayCUE-8 unit can be driven from one IR/SERIAL port.

Glossary

0 - 9

10/100Base-T

The Ethernet protocol that uses UTP (Unshielded Twisted Pair) or STP (Shielded Twisted Pair) cable. Data transmitted between two points in a given amount of time is equal to either 10 Mbps or 100 Mbps.

1000BaseT / Gigabit Ethernet

An Ethernet standard that transmits at 1 Gbps over twisted pair wire.

802.11b

A wireless networking standard that specifies the maximum data transfer rate of 11 Mbps. It operates in the 2.4 GHz frequency band.

802.11g

A wireless networking standard that specifies the maximum data transfer rate of 54 Mbps. It operates in the 2.4 GHz frequency band. This standard is backward compatible with 802.11b devices.

802.11n

A wireless networking standard that specifies the maximum data transfer rate of 540 Mbps. It operates in the 5 GHz and 2.4 GHz frequency bands.

802.3af (802.3at Type 1)

The Power over Ethernet (PoE) standard. A technology enabling an Ethernet network cable to deliver both data and power. The voltage is 44 – 57 V and about 13 W of power is available at the powered device. For more details see www.poweroverethernet.com.

802.3at Type 2

The proposed Power over Ethernet (PoE Plus) standard. A technology enabling an Ethernet network cable to deliver both data and power. The voltage is 50 – 57 V and 30 W of power will be available at the powered device. For more details see www.poweroverethernet.com.

A

Access Point

A device that allows wireless-equipped computers and other devices to communicate with a wired network. Also used to expand the range of a wireless network.

Ad-hoc

A group of wireless devices communicating directly with each other (peer-to-peer) without the use of an access point.

AES (Advanced Encryption Standard)

A security method that uses symmetric 128-bit block data encryption.

B

Backbone

The part of a network that connects most of the systems and networks together, and handles the majority of data.

Bandwidth

The transmission capacity of a given device or network.

Beacon Interval

Data transmitted on your wireless network that keeps the network synchronized.

Bridge

A device that connects different networks.

Broadband

An always-on, fast Internet connection.

C

Cable Modem

A device that connects a computer to the cable television network, which in turn connects to the Internet.

CSMA/CA

Carrier Sense Multiple Access/Collision Avoidance is a method of data transfer that is used to prevent data collisions.

CTS (Clear To Send)

A signal sent by a wireless device, signifying that it is ready to receive data.

D

Daisy Chain

A method used to connect devices in a series, one after the other.

DDNS (Dynamic Domain Name System)

Allows the hosting of a website, FTP server, or e-mail server with a fixed domain name (e.g. www.cuesystem.com) and a dynamic IP address.

Default Gateway

A device that forwards Internet traffic from your local area network.

DHCP

Dynamic Host Configuration Protocol is a networking protocol that allows administrators to assign temporary IP addresses to network computers by "leasing" an IP address to a user for a limited amount of time, instead of assigning permanent IP addresses.

DMZ (Demilitarized Zone)

Removes the Router's firewall protection from one PC, allowing it to be seen from the Internet.

DNS (Domain Name Server)

The IP address of your ISP's server, which translates the names of websites into IP addresses.

Domain

A specific name for a network of computers.

Download

To receive a file transmitted over a network.

DSL

Digital Subscriber Line is an always-on broadband connection over traditional phone lines.

DSSS

Direct-Sequence Spread-Spectrum frequency transmission with a redundant bit pattern resulting in a lower probability of information being lost in transit.

DTIM

Delivery Traffic Indication Message is a message included in data packets that can increase wireless efficiency.

Dynamic IP Address

A temporary IP address assigned by a DHCP server.

E

EAP

Extensible Authentication Protocol is a general authentication protocol used to control network access. Many specific authentication methods work within this framework.

EAP-PEAP

Extensible Authentication Protocol-Protected Extensible Authentication Protocol is a mutual authentication method that uses a combination of digital certificates and another system, such as passwords.

EAP-TLS

Extensible Authentication Protocol-Transport Layer Security is a mutual authentication method that uses digital certificates.

Encryption

Encoding data transmitted in a network.

Ethernet

A networking protocol that specifies how data is placed on and retrieved from a common transmission medium.

F

Finger

A program that tells you the name associated with an e-mail address.

Firewall

A set of related programs located at a network gateway server that protects the resources of a network from users of other networks.

Firmware

The programming code that runs a networking device.

Fragmentation

Breaking a packet into smaller units when transmitting over a network medium that cannot support the original size of the packet.

FTP

File Transfer Protocol is a protocol used to transfer files over a TCP/IP network.

Full Duplex

The ability of a networking device to receive and transmit data simultaneously.

G

Gateway

A device that interconnects networks with different, incompatible communications protocols.

H

Half Duplex

Data transmission that can occur in two directions over a single line, but only one direction at a time.

HTTP

HyperText Transport Protocol is a communications protocol used to connect to servers on the World Wide Web.

Infrastructure

A wireless network that is bridged to a wired network via an access point.

I

IP

Internet Protocol is a protocol used to send data over a network.

IP Address

The address used to identify a computer or device on a network.

IPCONFIG

A Windows 2000 and XP utility that displays the IP address for a particular networking device.

IPSec

Internet Protocol Security is a VPN protocol used to implement secure exchange of packets at the IP layer.

ISM band

Radio bandwidth utilized in wireless transmissions.

ISP

Internet Service Provider is a company that provides access to the Internet.

L

LAN

Local Area Network includes the computers and networking products that make up your local network.

LEAP

Lightweight Extensible Authentication Protocol is a mutual authentication method that uses a username and password system.

M

MAC Address

Media Access Control address is a unique address that a manufacturer assigns to each networking device.

Mbps

MegaBits Per Second is one million bits per second. It is a unit of measurement for data transmission.

mIRC

An Internet Relay Chat program that runs under Windows.

Multicasting

Sending data to a group of destinations at once.

N

NAT

Network Address Translation technology translates IP addresses of a local area network to a different IP address for the Internet.

Network

A series of computers or devices connected for the purpose of data sharing, storage, and/or transmission between users.

NNTP

Network News Transfer Protocol is a protocol used to connect to Usenet groups on the Internet.

Node

A network junction or connection point, typically a computer or work station.

O

OFDM

Orthogonal Frequency Division Multiplexing is frequency transmission that separates the data stream into a number of lower-speed data streams, which are then transmitted in parallel to prevent information from being lost in transit.

P

Packet

A unit of data sent over a network.

PEAP

Protected Extensible Authentication Protocol is a mutual authentication method that uses a combination of digital certificates and another system, such as passwords.

Ping

Packet INternet Groper is an Internet utility used to determine whether a particular IP address is online.

POP3

Post Office Protocol 3 ia a standard mail server commonly used on the Internet.

Port

The connection point on a computer or networking device used for plugging in cables or adapters.

PoE

Power over Ethernet is a technology enabling an Ethernet network cable to deliver both data and power. For more details see 802.3af, 802.3at or www.poweroverethernet.com.

PPPoE

Point-to-point Protocol over Ethernet is a type of broadband connection that provides authentication (username and password) in addition to data transport.

PPTP

Point-to-Point Tunnelling Protocol is a VPN protocol that allows the Point-to-point Protocol (PPP) to be tunnelled through an IP network. This protocol is also used as a type of broadband connection in Europe.

Preamble

Part of the wireless signal that synchronizes network traffic.

R

RADIUS

Remote Authentication Dial-In User Service is a protocol that uses an authentication server to control network access.

RJ-45

Registered Jack-45 is an Ethernet connector that holds up to eight wires.

Roaming

The ability to take a wireless device from one access point range to another without losing the connection.

Router

A networking device that connects multiple networks together.

RTS

Request To Send is a networking method of coordinating large packets through the RTS Threshold setting.

S

Server

Any computer whose function in a network is to provide user access to files, printing, communications, and other services.

SMTP

Simple Mail Transfer Protocol is a standard e-mail protocol on the Internet.

SNMP

Simple Network Management Protocol is a widely used network monitoring and control protocol.

SOHO

Small Office/Home Office is a market segment of professionals who work at home or in small offices.

SPI

Stateful Packet Inspection firewall is a technology that inspects incoming packets of information before allowing them to enter the network.

Spread Spectrum

Wideband radio frequency technique used for more reliable and secure data transmission.

SSID

Service Set IDentifier is the name of your wireless network.

Static IP Address

A fixed address assigned to a computer or device that is connected to a network.

Static Routing

Forwarding data in a network via a fixed path.

Subnet Mask

An address code that determines the size of a network.

Switch

A data switch that connects computing devices to host computers, allowing a large number of devices to share a limited number of ports.

T

TCP

Transmission Control Protocol is a network protocol for transmitting data that requires acknowledgement from the recipient of data sent.

TCP/IP

Transmission Control Protocol/Internet Protocol is a set of instructions PCs use to communicate over a network.

Telnet

A user command and TCP/IP protocol used for accessing remote PCs.

TFTP

Trivial File Transfer Protocol is a version of the TCP/IP FTP protocol that has no directory or password capability.

Throughput

The amount of data moved successfully from one node to another in a given time period.

TKIP

Temporal Key Integrity Protocol is a wireless encryption protocol that provides dynamic encryption keys for each packet transmitted.

Topology

The physical layout of a network.

TX Rate

Transmission Rate.

U

UDP

User Datagram Protocol is network protocol for transmitting data that does not require acknowledgement from the recipient of the data that is sent.

Upgrade

To replace existing software or firmware with a newer version.

Upload

To transmit a file over a network.

URL

Uniform Resource Locator is the address of a file located on the Internet

V

VPN

Virtual Private Network is a security measure to protect data as it leaves one network and goes to another over the Internet.

W

WAN

Wide Area Network is the Internet.

WEP

Wired Equivalent Privacy is a method of encrypting network data transmitted on a wireless network for greater security.

WINIPCFG

A Windows 98 and Me utility that displays the IP address for a particular networking device.

WLAN

Wireless Local Area Network is a group of computers and associated devices that communicate with each other wirelessly.

WPA

Wi-Fi Protected Access is a wireless security protocol using TKIP (Temporal Key Integrity Protocol) encryption, which can be used in conjunction with a RADIUS server.